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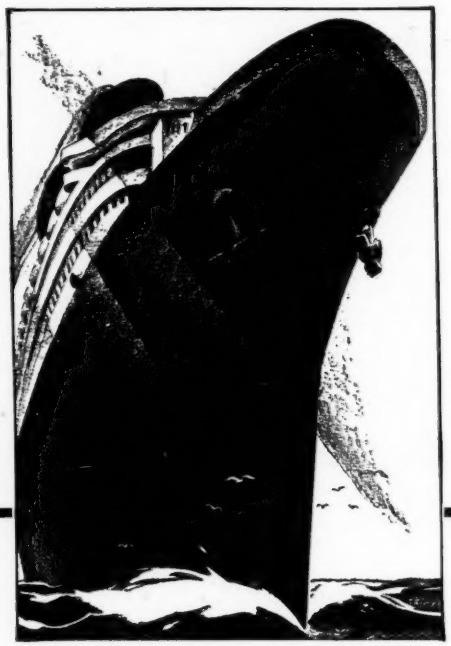

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"To encourage in any practicable ways research work on chemical processes and materials of importance to the Textile Industry.

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AMERICAN
DYESTUFF REPORTER

VOLUME 26 JUNE 14, 1937 NUMBER 12

Spray Test for

Evaluating Water Repellency

A. A. COOK* and J. ZAPARANICK**

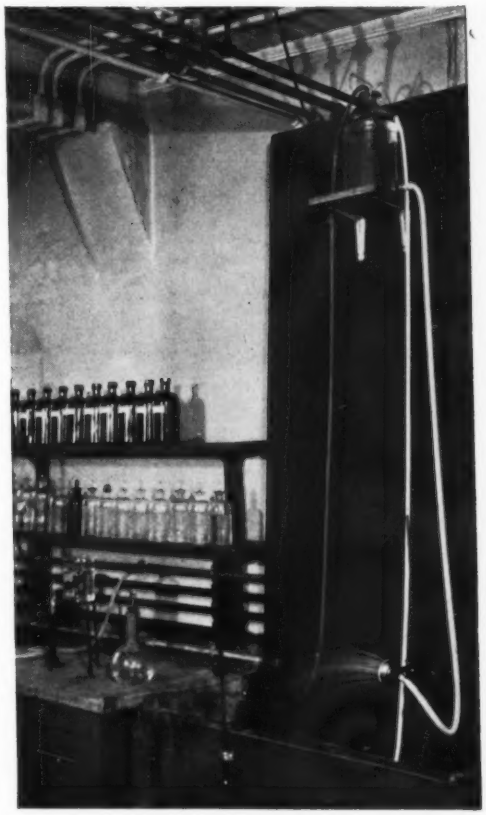
A PRACTICAL and simple test capable of semi-quantitative results has been developed and tested out for a period of six months in the laboratories of the Arkansas Company, Inc. It is believed that this test is of such a nature as to more nearly approximate the actual conditions of exposure than any of the other types of methods in general use. The general principle of the method to be described below is in itself neither new nor novel and doubtless has been used many times before in one or another form.

This method consists in brief of spraying a weighed piece of the fabric (which has been processed with a water-repellent compound) under certain carefully controlled conditions, and then re-weighing to determine the amount of moisture which has been absorbed. The development has consisted chiefly in working out a technique for controlling the conditions of spraying and handling the sample so that the results are practically quantitative in degree and may be readily duplicated at any time. This method has been found very useful in comparing two or more products for water-repellency and also as a control test.

Furthermore, the method is exceedingly simple and short and requires no elaborate or expensive apparatus. The actual time of one determination on a piece of treated fabric is not over three (3) minutes. The apparatus may be obtained and set up almost anywhere without special laboratory facilities, except for a balance capable of weighing to one decigram or preferably to one milligram.

To sum up then, the method to be described below in detail has the following advantages:

1. Approximates practical conditions.
2. Is capable of semi-quantitative results.
3. Is simple and requires no expensive apparatus.



Apparatus for Spray Test.

COMPARISON WITH OTHER METHODS

The most common method of attempting to evaluate water-repellency is what is commonly known as the "Static Head" test. The procedure followed in such a test may vary from a simple "cup" test to an elaborate device for accurately recording the pressure necessary to force water through a fabric under specific conditions. As far as the "cup" test is concerned it may be of qualitative significance and very useful as a sorting test. When, however, this type of test is attempted as a quantitative procedure, it is our opinion based on considerable experimental work, that it is distinctly limited in scope and can only be applied successfully to heavy fabrics and to those which have been actually water-proofed with an air-impervious coating. With ordinary fabrics of light and medium weight processed to give a water-repellent finish, it may

*Chief Chemist and **Research Chemist, Arkansas Company, Inc.

be shown that the type of weave, the count and other physical factors in the construction of the fabric as well as unevenness and other defects, have definite adverse effects on any quantitative pressure method. Experience with a method of this type has indicated lack of consistency in the results.

The dropping test has also been attempted in a quantitative way and consists in determining how many drops (or cubic centimeters) of water falling from a certain height, are necessary to penetrate the fabric under test. Another variation of this test is to determine the critical height at which water dropping at a definite rate will cause penetration of the fabric. Again as in the case of the "static head" type of test, this method has its distinct limitations and offers considerable difficulty in the way of a simple and readily controlled technique.

An immersion test has been proposed by several practical minded textile men and does have some merit but unfortunately is very difficult to control for consistent results. It consists essentially of immersing a weighed piece of the fabric in water for a certain length of time and then reweighing after a definite draining period to eliminate excess water. It is more nearly like the spray method in principle than any of the other methods, and possibly with refinements could be developed into a method of fair accuracy for certain kinds of fabrics.

The measurement of the angle of contact is doubtless the most scientific method proposed to date. It is a technically correct way of getting at the fundamental principles of the problem in question, in that it takes into consideration the surface tension of the treated fabric and the resistance to spreading of water when placed in contact with it. However, the technique involved is rather complex and special apparatus is required.

DETAILS OF SPRAY TEST

The apparatus consists of a small spray-head about 2½ inches in diameter connected with a reservoir by means of rubber tubing. An aspirator bottle of one gallon capacity is preferable for the reservoir, but any glass bottle of reasonable capacity will serve. The reservoir in addition to the spray outlet must have an incoming source of water, (tap or water line connection) an air inlet and an overflow by means of which the constant head is maintained. The total head used in this test is five feet. The spray-head is held in a horizontal position by means of a clamp on a stand and may be conveniently turned on and off by a spring clamp on the rubber tubing just above the spray-head. The piece of fabric cut approximately six (6) inches square and weighed to the nearest milligram, is placed on three wire hooks attached loosely to a horizontal rod or support, opposite the spray-head. The distance between the sample of fabric and the spray-head is fifteen inches, but this may vary with different set-ups depending on the exact construction of the spray-head and other relationships. The important factor is that the spray-head should be placed in such a position that the spray hits the fabric squarely and as completely as possible. Once the proper position is found for a certain set-up, it must be kept constant for all subsequent tests.

To start a test the water is turned on to the reservoir and the rate of flow adjusted until there is a steady and substantial overflow. The weighed piece of fabric is placed in position and the spring clamp is opened and the spray of water hits the fabric. At the end of one (1) minute the clamp is closed. The sample is removed quickly from the hooks, given a sharp shake once in both directions (warp and filling) and then passed gently over a clean smooth knife-edge each way to remove all traces of mechanical water clinging to the fabric. It is then quickly reweighed and the water-repellancy value calculated as follows:

$$\text{Water-repellancy Value} = \frac{\text{Gain in weight}}{\text{Weight fabric before}} \times 100$$

Example:

Weight fabric before	4.595
Weight fabric after	5.131
Gain in weight	0.536

$$\text{Water-repellency value} = \frac{.536}{4.595} \times 100$$

$$\text{Water-repellency value} = 11.7$$

The actual time of the test including both weighings is about three minutes. In making comparisons, it is always desirable to make two or preferably three tests on each product in order to obtain a fair average. This practice serves as a check on the method and at the same time any results which are out of line may be discarded.

INTERPRETATION OF RESULTS

This test has been given a thorough work-out in our laboratory over a period of six months. It has given in the hands of different operators, highly consistent results. In general its accuracy is within 2 to 3 per cent on check tests, which is well within semi-quantitative requirements. Many types of fabrics have been tested by this method and it appears to be equally applicable to all materials and weaves and to heavy, medium and light fabrics. Unevenness and defects have little if any effect on the results.

We have attempted a general classification by which many types of fabrics may be graded as their water-repellency value. There are doubtless exceptions to this scheme which should be considered before attempting to apply it too rigidly. It is as follows:

Water-repellency Value by Spray Test	*Tentative Rating*
10 and under	Excellent
10 to 20	Good
20 to 30	Fair
30 to 50	Partial
over 50	Poor

Tests on untreated fabrics of light and medium weights show a water repellent value of between 100 and 200, while heavy fabrics usually are over 200.

A series of tests which is of interest in showing how the degree of water-repellency improves with increasing concentration of the processing bath, was made on a woolen ski-cloth. The results were as follows:

Concentration of bath	*Water-repellent Value*
None	235.
0.5%	44.5
2.0%	35.4
5.0%	18.3

In conclusion, the interpretation of the results of this method appear to be as direct and simple as the method itself.

TECHNICAL NOTES FROM FOREIGN SOURCES

A symposium on the scientific and technical aspects of wetting and detergency was held at the Huxley Building, Imperial College of Science and Technology, Kensington, England, on Friday and Saturday, February 19 and 20.

Dr. R. H. Marriott, President of the British Section of the International Society of Leather Trades' Chemists, welcomed the participants. Professor F. G. Donnan took the chair for the morning session. After lunch, the chair was occupied by Dr. W. Clayton, F.I.C., and on the Saturday morning, the meeting was presided over by Dr. R. H. Marriott, F.I.C.

Some 250 chemists attended the meetings.

On the Friday evening an informal dinner was held at the Chantecleer Restaurant, Soho, W.1, and the guests of honor included Prof. F. G. Donnan, Prof. H. Freundlich, Prof. A. Ferguson, Prof. H. S. Taylor of Princeton University, U. S. A., and Dr. W. Clayton.

The following are abstracts* of some of the papers read and discussed during the Symposium:

Some Problems of Wetting

Allan Ferguson, M.A., D.Sc., F. Inst. P.—This communication describes methods for the measurement of surface tension and angles of contact—the quantities of fundamental importance in dealing with problems of wetting. The surface tension methods described demand the use of no more than a few cubic millimeters of the liquid under test, and no knowledge of its density is required. Assuming the surface tension to be known, contact angles may be determined by directly measuring the pull on a plate touching the liquid, or by immersing the plate until the surface tension pull is just balanced by the buoyancy.

The Bartell Cell Technique

Dr. S. H. Bell, Dr. J. O. Cutter and C. W. Price—The liquid-solid contact angle and the adhesion tension in the system linseed oil-lithopone have been determined by measuring the pressure set up by the liquid upon entering the capillaries of a compressed plug of the solid. The adhesion tension so determined for a number of lithopone samples is of the order of 25-30 dynes/cms.

*Reprinted from "The Dyer".

Apparatus for the Measurement of Contact Angles by the Plate Method

C. G. Sumner, M.Sc., Ph.D., A.I.C.—The technique of measurement of contact angles against water was described, using an apparatus of the "tilting plate" type which had the following essential features: (1) The water surface is cleaned by the overflow method. (2) The axis of rotation of the plate lies in the water surface, so as to minimize displacement of the line of contact during measurement. (3) Provision is made for forming either the "advancing" or "receding" angle of contact. (4) The contact angle is read directly on a scale.

A special device is incorporated for viewing the distortion of the water surface where the latter meets the solid. This depends on the observation of a line of light both directly and by reflection from the surface of the water. In the case of lacquered plates, the precision of measurement is found to depend on the surface being wetted, chiefly owing to an irregular line of contact being obtained in many instances.

Determination of Contact Angles on Thin Wires or Single Threads

N. K. Adam, D.Sc., F.R.S. and H. L. Shute—Dr. Adam described a method of measuring angles on thin wires or single textile fibers. The method is identical in principle with the ordinary "plate" method, the junction of the fiber and liquid surface being observed through a low power of the microscope. The accuracy obtainable is about equal to that of the "plate" method.

The Chemistry of Wetting Out Agents

H. K. Dean, B.Sc., Ph.D., A.I.C.—Fatty acid salts were the original type of wetting agent and their stability in hard water, solubility and wetting power can be changed by alterations in the chain length, by introduction of double bonds, by the formation of amine salts and by sulfonations. The importance of solubility and balance was discussed.

The inherent disability of the soaps, namely precipitation by lime, can be largely overcome by blocking the carboxylic acid group by amidation, esterification or reduction to the alcohol. The introduction of a sulfonic acid

group is a method applicable to compounds containing a double bond, aromatic ring or halogen atom; alcohols can be esterified with sulfuric or phosphoric acids, or organic acids containing solubilizing groups—citric and sulfoacetic acids. Amino compounds include an important group of wetting agents. Straight chain and cyclo aliphatic amines are stable in hard water, while many quaternary ammonium salts are effective in acid, neutral or alkaline solutions. Cyclic amines, iminazoles, thioazoles or oxazoles form the basis of other agents. Mercaptans and phenols can replace the normal alcohols in many cases and sulfurated petroleum fractions are well-known and contain no carboxyl group. Ethers too are employed and have the advantage of insensibility to alkali; the related acetals and the condensation products of aldehydes and amines have recently been utilized.

Wetting and Deflocculation

A. de. Waele, F.I.C., F. Inst. P.—A permanent dispersion of a solid powder in a liquid is characteristic of the effect of a peptizer or deflocculator acting at the interface to inhibit mutual attraction of the solid particles. The mechanism of peptization is in the nature of chemo-sorption at the interface, while deflocculation is resultant on capillary adsorption. Investigation as to the nature and degree of the stabilization in a solid liquid dispersion may be followed by determination of the plastometric constants.

Waterproofness of Vegetable Tanned Leather

R. S. Edwards, Ph.D., A.R.C.S., D.I.C.—Waterproofness is a term which has been the subject of much confused thinking on the part of experimenters in past years. It is suggested that waterproofness cannot be uniquely defined and that two main factors must be recognized: (a) the resistance of leather as a wall to the passage of water, (b) its absorbing capacity.

The first essential is to devise adequate means of test and a review was given of the developments in this direction. In accordance with the suggested definition of waterproofness, they fall into two classes, water permeability and water absorption tests. The latter measurement is the easier and has been the more popular, but water permeability has proved more susceptible to theoretical examination.

It is concluded that all attempts to express the entry of water into leather, either from one face to another or during immersion, are based fundamentally upon the application of Poiseuille's law to very fine capillary tubes in the process of filling. It has been further shown that the holding capacity is dependent upon the free or air space in the leather and the residual swelling capacity of the fibers themselves. Water soluble matters affect the rate of entry via the surface tension and viscosity of the solution they form with the entering water.

Waterproofness can be controlled in many ways, but it is suggested that the ideal place is the tannery rather than the shoe factory. If, however, it is desired to improve the finished product, the oils, fats and waxes may be used, and a suitable method of treatment was suggested. By this process, waxes are applied to the flesh side only of the leather, a procedure greatly facilitating shoe manufacturing operations. An example of the effects of such a treatment was given.

The Wetting of Skin and Leather

R. H. Marriott, D.Sc., F.I.C.—The microscopical and ultramicroscopical structure plays a very important part in the wetting of skin and leather by water and oils. In addition, the chemical properties also are factors as well as the polarity of the wetting medium.

In wetting dried skins with water, the problem involved the chemical state of the interfibillary proteins rather than the surface activity of the water. In the unhairing process, however, emulsification of some of the fats must be brought about, small additions of caustic soda being of advantage.

In currying and those processes involving the absorption of oil, the chief factors are the polarity of the oil and the ability of the oil to spread over the wet leather fibers. Owing to the extremely small openings in the outer surfaces of the leather, penetration can only occur if the oil can form a film thin enough to pass through the openings. The process most difficult to explain is that of fat-liquoring and it would appear that for this process to be successful the oil droplets must break on the surface at such a rate that the oil film is thin enough just to penetrate. If the film is too thin, i.e., the emulsion breaks too slowly, then the penetration will be too great and will produce poor leather. On the other hand, if the breaking is too rapid the film will be too thick to penetrate and the leather will be greasy.

The Mechanism of Detergent Action

Conmar Robinson, Ph.D., A.R.C.Sc.I., A.I.C. — The mechanism of detergent action was discussed. The initial and most important part of the process is the displacement of the oil from the fiber by the detergent solution. This involves the contact angle made (in the solution) by the oil-solution interface with the fiber becoming zero. Measurements of contact angles have supported this conception. For this angle to be zero, Adam has shown that the adhesion tension between solution and fiber minus that between oil and fiber divided by the oil-solution interfacial tension must be equal to or greater than unity.

No values for the solution fiber adhesion tensions are at present available. Interfacial tension values are qualitatively in agreement with the detergent action of certain systems. Here it would seem that changes in the interfacial tension run parallel to, or predominate over, changes in the adhesion tensions. In other cases, no such parallelism is found. In such cases it is suggested that the

(Continued on page 348)

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Rayon Technical Conference

Washington, D. C., May 14-15, 1937

Technical Sessions and Registration at National Bureau of Standards. Headquarters: Wardman Park Hotel

Sponsored by
American Association of Textile Chemists and Colorists.
Committee D 13, American Society for Testing Materials.
U. S. Institute for Textile Research.
Throwsters Research Institute.
Textile Division, The American Society of Mechanical Engineers.
Washington, D. C., Section of The American Society of Mechanical Engineers.

SESSION I

Friday Morning, May 14, 9:30 A. M.

Lecture Room, 4th floor, East Building, U. S. Bureau of Standards.

Address of Welcome: Dr. Lyman J. Briggs, Director of National Bureau of Standards.

Chairman: C. H. RAMSEY, President, Morrison Machine Company, representing the A.S.M.E.

Address of Welcome: M. X. Wilberding, Chairman, Washington, D. C., Section, A.S.M.E.

"Air Conditioning of Textile Plants Making and Using Synthetic Rayon" by L. L. Lewis, Carrier Engineering Corporation.

"The Mechanics of Synthetic Fiber Weaving" by Albert Palmer, Crompton & Knowles Loom Works.

SESSION II

Friday Afternoon, 1:30 P. M.

Chairman: DR. LOUIS A. OLNEY, of the Lowell Textile Institute, and Chairman of Research Committee, of the American Association of Textile Chemists and Colorists.

Dr. Olney: About six years ago in response to an urgent demand on the part of the members of the A.A.T.C.C., the Research Committee organized a sub-committee on Rayon and under the leadership of Mr. B. L. Hathorne as Chairman, this committee soon became very active and has to its credit many accomplishments.

The extensive introduction of rayon crepes about three years ago soon lead to the discovery that there was much to be learned in regard to their manufacture, dyeing, and finishing before those responsible for their production could have any peace of mind. All kinds of difficulties arose and for the most part these were laid at the door of the dyer and finisher. It was not long before the dyers and finishers were accusing the weavers of improper handling, and the weavers in turn accused the throwsters for the fundamental trouble. When this situation had developed into more or less of a vicious circle, the Throwsters Institute suggested that the Research Committee of the A.A.T.C.C. cooperate with them in a fundamental study of the whole subject.

Our Association secured a grant of $2,500 from the Textile Foundation contingent upon the Throwsters Institute securing an equal amount, which they did, and the work was soon under way.

Since the original grant a second $2,500 has been allocated by the Textile Foundation for the completion of this work and this has been matched by an equivalent amount of contributions from industry in the form of materials and service.

About this time the U. S. Institute for Textile Research called a conference in New York upon the general subject of crepe fabrics, which was well attended and which served to create a very general interest in this particular project. One statement made during this conference impressed me at the time as emphasizing the unsatisfactory condition which existed. It was to the effect that if you should take the entire production of crepe from one loom, divide it into three equal lengths, and send it to three different finishers, it would be returned with three entirely different pebble effects. The statement was also made that if three pieces of crepe from three different looms, supposed to be running upon the same specifications were sent to the same three finishers, they were likely to be returned quite different in appearance.

A joint committee consisting of some of the original members of the Rayon Committee of the A.A.T.C.C., and in addition members from the Throwsters Research Institute, was organized under the chairmanship of Mr. B. L. Hathorne. This committee had many meetings and finally organized a very definite program of procedure. The committee is as follows:

B. L. HATHORNE, *Chairman*

Mr. H. E. Bishop, Bliss Silk Throwing Co. Representing T.R.I.

Dr. F. Bonnet, The Viscose Company. Representing A.A.T.C.C.

Mr. C. W. Dall, Nat'l Rayon Weavers Ass'n. Representing T.R.I.

Mr. C. Epstein, Liberty Throwing Co. Representing T.R.I.

Mr. G. Friedlander, Duplan Silk Corp. Representing T.R.I.

Mr. E. C. Geier, Duplan Silk Corp. Representing T.R.I.

Mr. V. McCullum, National Dyeing & Ptg. Co. Representing A.A.T.C.C.

Mr. James J. McGibbon, North American Rayon Co. Representing A.A.T.C.C.

Dr. J. Quig, E. I. du Pont de Nemours & Co. Representing A.A.T.C.C.

Dr. I. J. Saxl, E. F. Houghton & Co. Representing T.R.I.

Dr. H. D. Smith, A. M. Tenney Associates. Representing A.A.T.C.C.

G. A. Urlaub, Throwsters Research Institute. Representing T.R.I.

Mr. Wm. Witte, National Dyeing & Ptg. Co. Representing A.A.T.C.C.

Mr. W. F. Macia was chosen as the research associate to conduct the preliminary work and this selection was wise because he has proved to be an untiring worker and one who has had much to contribute towards the working out of the whole project.

Before presenting Mr. Macia as the first speaker, I will say that in the preparation of his paper he has labored under a considerable disadvantage in that much of the work which has been done is awaiting completion in certain respects, and as yet is not ready for publication.

Furthermore, the program as a whole is too long to consider at this time and the reports which have been presented so far include several hundred pages of typewritten material. A complete report of this work will be published during the next six months in the Proceedings of the A.A.T.C.C. and quite likely will be available in book form later on.

It is a pleasure to present Mr. W. F. Macia at this time.

Some Causes of

Rayon Crepe Variations

with Special Reference to Throwing*

W. F. MACIA†

PURPOSE

THE purpose of this discussion is to describe some of the causes of variations in rayon crepe fabrics and to suggest possible ways and means of overcoming these variations by improving the mechanical operations in throwing plants.

MECHANICAL HISTORY OF INDUSTRY

To discuss this subject properly it is necessary to review briefly the mechanical history and development of the rayon crepe industry.

The manufacture of high twist or crepe rayon yarns began on a small scale about ten years ago and since then the industry has grown at a tremendous rate. In 1936 it was estimated that more than 50,000,000 lbs. of rayon yarn were processed in throwing plants. An industry of such magnitude can proudly demand a place among other leading textile branches and cannot be ignored by industrialists, technicians and mechanical engineers. Shortly after rayon crepe yarns were introduced into the market it was realized that they could be manufactured into satisfactory crepe dress fabrics which could be merchandized at drastically lower prices than silk crepe dress fabrics. In order to accomplish this it was necessary to make numerous changes on the existing mechanical equipment.

There were no machines especially designed to insert high twist in rayon yarns so the first experiments in crepe manufacturing were made on silk or "up spinning" or cotton twisting or "down spinning" machines. It was soon recognized that rayon had its own individuality and that its processing required more precision than could be obtained on the original silk and cotton twisting machines. The machines had to be improved in many respects to accommodate the new fiber. Most of the improvements were made "piece meal" and for this reason few of them received much attention. However, there is considerable difference between the present modern throwing plants and those of ten years ago.[1]

Some new machines were made but most of the manufacturers did not think they were any better than existing machines. Since there was a large number of spindles standing idle in both the cotton and silk industries due to

*Presented at Rayon Conference, May 14, 1937.

†Research Fellow of: American Association of Textile Chemists and Colorists, Throwsters Research Institute, Inc., and The Textile Foundation.

the economic conditions throughout the country, manufacturers were reluctant to junk apparently good machines when at a small expense they could be altered so they could be operated on rayon. The demand for rayon crepes, presented an opportunity which could not be overlooked by any progressive manufacturer. The result of these circumstances was that the present rayon crepe machinery is an out-growth of the silk and cotton systems.

The silk or "up-spinning" system was better equipped to process rayon crepes than the cotton system because it had always been used for spinning high twist yarns whereas the cotton system had been used for spinning lower twist yarns. A recent survey showed that there was a trend toward the increased use of the cotton system[2] but the silk system has also gained much favor because of its ability to meet the increasing demand for extremely high twist yarns. Most of the new machines which have been purchased recently have been the "up spinning" or silk type.

Both of these systems have their respective merits as indicated by their extensive use. This discussion, however, will be confined to the mechanics of the silk or "up spinning" system.

DESCRIPTION OF MODERN THROWING PROCESSES

For the benefit of those who are not entirely familiar with the modern throwing processes, I will describe in detail the machines used and their respective purposes.

The raw rayon yarn is received at the throwing plants in skeins which are packed into cases containing from 200 to 400 lbs. The skeins vary from 3,000 to 30,000 yarns in length depending on the denier or size of the yarn.

The yarn is first soaked in an aqueous solution containing lubricants and protective sizes. There are two methods of applying the sizes and lubricants to rayon skeins, in general use today. The most popular method is a process inherited from the silk crepe industry and is known as the tub method. 110 to 250 lbs. of skeins are submerged in tubs or vats containing the previously prepared solutions and the skeins are allowed to remain in the tubs from 15 to 60 minutes. The more modern method of soaking rayon consists of the use of machines which are in principle similar to the Smith Drum skein dyeing machine. After the skeins are soaked they are allowed to drain, then are hydro-extracted, shaken out and hung in drying ovens. When they are dry they are put on the winding machines where the yarn is transferred from the skeins to bobbins. The winder bobbins are then placed on the spindles of the spinning machines and the yarn is twisted as it is drawn off the winding bobbin to a metal or hard fiber bobbin or what is known as a spinning shaft. The shafts containing the yarn are then placed in a steam box which sets the twist. The yarn is then redrawn from the spinning shafts to a shipping spool and is ready for the weaving plant.

SOAKING

When high twist was first put in rayon yarn it was immediately realized that rayon needed lubrication and a certain amount of protection and reinforcement against the cumulative strains and frictions of the various processes.

The protection or what is generally known as the size or dope may consist of numerous ingredients but up to very recently the base of the sizes used most extensively has been gelatine, and the lubricants have consisted primarily of emulsifiable vegetable oils. Chemical technicians have been using much effort to make new sizes which have all the merits of the present gelatine sizes yet none of their inconsistencies. Some new sizes have been developed which have met with much favor by the manufacturers who have used them.

We are not planning to discuss the respective merits of the various sizes and oils used in soaking of rayon crepe yarns but we are going to confine our thoughts to the methods of applying these ingredients. However, we want to take this opportunity to urge more effort in making soaking sizes and oils which are uniform within each lot and from lot to lot because the consistency of the soaking solution has a tremendous influence upon the pebble of the finished cloth.

It is now known that variations in the application of the soaking solution produces variations in the magnitude of the pebble of the finished fabric.[3] Much effort has been used to develop methods of applying the soaking solution uniformly on each skein. The methods most generally used have been fairly satisfactory although there is still much room for improvement.

The tub soaking method originated in the silk mills and it has been used extensively by nearly all of the throwsters. It simply consists of submerging the yarn in large monel metal tubs containing the soaking solution. One bath is usually used to soak several batches of yarn; the bath being replenished with added ingredients or a standard solution after each batch. Although definite data is not available in regard to the absorption preferences of rayon yarns for sizes and soaking oils, it can be expected that the ratio of the ingredients in the bath may change after each batch as well as the total volume of the bath. Recent research showed that the pebble of the finished fabric reflects any change in the ratio of the ingredients, therefore it is imperative that the ratio be kept constant[4]. It is my recommendation that further extensive research be made of this factor.

The soaking machines have eliminated some of the irregularities present in the tub-soaking method but before the machines are universally accepted much proof must be furnished of their superiority over the tub method. In their behalf it can be favorably said that they have attracted the attention of the industry from an economic standpoint and form the basis for further exploitation of

methods and machines for applying soaking solutions. I would like to emphasize the need for closer study of this mechanical—chemical phase of the throwing industry.

EXTRACTION

After the skeins are soaked they are extracted in standard extractors of various sizes. This appears to be one of the danger spots in the soaking room. The automatic stop switches have eliminated the possibility of over running, yet little is known of the variations in moisture within a batch in a full extractor, how much actual soaking solution is removed and how much of the liquid removed is water. The centrifugal flow of the solution may remove some of the important ingredients from some skeins or bundles and deposit them on others. If such a movement does take place in the extractors there may be an uneven distribution of the sizes and oils on the yarn which would be very undesirable. It is certainly important to maintain the uniformity of the size application after so much effort has been exerted to put it on evenly, therefore, a thorough study should be made of the extraction process to determine a means of removing the surplus solution uniformly from each skein. Since this operation is entirely mechanical, it should be given consdierable thought by mechanical engineers, yet any study of this operation should be carried on jointly by chemical and mechanical engineers. We cannot pass lightly over any process in which there is any doubt as to its accuracy of performance.

SKEIN SHAKING AND DYEING

The extracted skeins have to be shaken out before they are placed in the drying ovens because as the size drys it hardens and it would stick the ends together if they were not separated. There have been some machines made to perform this operation but they have not been completely successful, and in the end they defeat their own purpose and for this reason most throwing plants shake out the skeins manually. There is a very good opportunity for the development of a machine which could do this job right and mechanical engineers could find a good market for a suitable machine. Any machine for this purpose should not put any strain on the yarn because in its wet state it is very easily stretched. The shaking out of the skeins plays an important part in the production of the winders and any move to improve this operation should include a foreman of the winding department.

Much progress has been made in the drying of rayon skeins. The same type dryers are used by throwsters as by the rayon manufacturers and skein dyers. Modern commercial drying ovens are built quite flexible so they can be readily adapted to the various purposes for which they are used. They are provided with modern instruments to indicate and record the conditions within them at all times.

At recent drying conferences it has been pointed out that if rayon is improperly dried its physical and chemical characteristics are permanently altered.[5] When throwing plants are pressed for production there is little danger of excessively drying the yarn because most of the plants only have drying facilities to handle enough yarn for average production consequently the yarn is pushed through the ovens as rapidly as possible. The most dangerous period for over drying is when work is slack in the plant and ovens are operated with part loads. Many ovens are adjusted to operate at certain temperatures with full loads and when they only have part loads the temperature increases and the actual drying time decreases so there is some danger of over drying. It has been claimed that over drying of yarn in the throwing plants causes the oils and sizes to bake on the fiber and form an insoluble coating that will not dissolve in the boil-off bath and will permanently damage the appearance of the finished fabric.

It would be very difficult to build an oven which would meet every requirement of the individual throwster because they handle such a variety of yarns. Skein sizes, denier and moisture contents may differ from day to day so they have to maintain very constant vigilance over this operation to get each lot properly dried. The length of time required to dry certain types of skeins to a definite moisture content is predetermined and this is used as a basis for all other similar skeins. The gauging of the dryness is done by feeling of the skeins after they have been in the ovens a certain length of time. The personal judgment of the operators plays an important part in this operation, yet it appears to work out quite well.

The weather often affects the rapidity of drying in some ovens. Where air is taken from outside of the plant into the ovens it varies with the outside fluctuations in atmospheric humidity. It should be possible to overcome this variable by taking the air for the dryers from a conditioned area. Probably more danger results from under drying of yarn in the throwing plants than over drying. In the event that the skeins are taken out of the ovens before they are thoroughly dry and they are wound too quickly the yarn may be permanently damaged because rayon is more easily stretched when it has a high moisture content.[6]

All the modern throwing plants have systems whereby the yarn from the ovens is hung in the winding room a definite length of time to permit it to adjust itself to the atmospheric conditions under which it will be wound.

It is very fortunate that the drying operation in throwing plants has progressed as rapidly as the drying of any of the other fibers in the textile industry and it is very rare that yarn is ever damaged in this operation. The optimum conditions in the drying operation would be to dry all the skeins to exactly the same moisture content each time. This would promote uniformity at this point.

WINDING

There is nothing very complicated about the winding process in throwing plants yet the production of the entire

mill is influenced by the manner in which the yarn is wound[7]. To the layman the simple process of putting a skein of yarn on a swift and drawing it off on to a spool seems so elementary that very little consideration is given this process. Throwsters realize, however, that the production of the spinning process is regulated by the way the spools are wound.

Rayon winding in the throwing plants introduced problems completely unknown in silk mills. There never was much precision needed in the winding of silk yarn because silk yarn was rarely spun directly from the winder spools. Except in single end spinning, the yarn in silk mills was drawn off the winding spools sideways on what is known as the 5-B twister whose function was to ply several ends together and insert a small amount of preliminary twist.

Rayon is rarely plyed and no preliminary twist is inserted so the 5-B machines are not used. The spools of yarn from the winders go directly to high twist spinners where they are placed on the spindles and revolved at from 8,000 to 11,000 r.p.m. as the yarn is being drawn off over the spool heads and twisted. For this reason rayon has to be wound uniformly or it will not spin satisfactorily.

In a survey of several of the better throwing plants, it was found that there were many extreme variations in the tensions and the running speed of the yarn in the winding operation.[8] While none of the variations had any influence upon the pebble of the finished fabric they created the basis for accumulative irregularities which affected the production of the entire plant. All of the throwing plants have honestly endeavored to eliminate all the variations possible but in the winding process they have been handicapped by the limitations of the winding equipment.

There have been very few basic changes in the mechanical structure of the winding machinery in the past twenty years. Some new machines have been offered which collectively incorporate all the minor improvements which have been made on the winders but some of the base faults have never been corrected. Most of the progressive throwing plants have kept up to date and have all the minor improvements offered by the new machinery on the market.

It has been previously pointed out that rayon winding in throwing plants demands more precision. In rayon winding it is very desirable to maintain a uniform spool speed. Even on many of the latest type machines the spools are driven by frictional contact from pulleys on the main shaft of the winders. Many rayon crepe plants have installed cork covered spindle pulleys to reduce the slippage but even this doesn't prevent all of the slippage and variations in speed from spool to spool still exist. A more uniform drive could be made to eliminate this variation. Numerous other opportunities for improvement could be pointed out such as: swift arms having improved bearings or swift rests, non-metallic swift axles, spools spindle eliminators, devices to regulate the tension on the yarn, etc.

There seems to be a good opportunity for some profitable research in the winding department of the throwing plants and mechanical engineers would do well to devote more thought to the improvement of this equipment and throwsters should not hesitate to offer their suggestions and fullest cooperation to the machine makers in any endeavor to improve the winding process.

SPINNING OR THROWING

The twist is inserted in the yarn in the spinning or throwing process. The spools containing the yarn from the winding operation are placed on the spindles of the spinners and the warn is drawn off by a metallic or hard fiber spool while the twist is being put in. The rapidity with which the yarn is drawn off regulates the number of turns of twist inserted.

Uniformity of speed from spindle to spindle is essential and the take-up spools or shafts must revolve at a positively uniform speed or there will be differences in twist from end to end. All the modern throwing plants have set up a system of policing the spindle speeds so that any variations in speed which develop due to mechanical wear is immediately corrected. Many new developments have been made in this process but they have not been accepted by throwsters because the cost of making the changes have not been warranted by the visible improvements in the yarn or production. The introduction of ball bearing spindles is a good example of one of the improvements in the spinning process. There is no doubt that these spindles are a great improvement over the old type yet in no way can it be shown that the production can be increased by their use or that the yarn will be improved in any manner. The power cost saving by such an installation is probably the biggest feature and it probably takes several years to save enough power to pay for the installation costs.

In principle most of the spinning machines of today are exactly the same as those of several years ago. As in the winding process the new spinning machines have collectively all the minor improvements which have been made during the past decade. All of the progressive throwsters have also installed the minor improvements on their machines so the machine makers have little new to induce the throwsters to replace the present machines.

Some of the newer type spinning machines have combined the entire throwing plant into one operation. Much can be said in favor of any attempt to improve the throwing machinery but throwsters have been hesitant in adopting some of the new machines because their advantages over the present machines have not been convincingly demonstrated.

In rayon spinning it is essential to process each end exactly the same. A recent survey showed that there was considerable variation in the tension exerted on the yarn

during spinning even in the best throwing plants.[9] The importace of uniformity of tension in this operation cannot be over emphasized although in the average plant the existing variations only have a slight effect upon the pebble of the finished fabric. Most of the throwsters have done all that is possible within their power to reduce the existing variations by closer supervision but even then they could not fully control them because of machine inefficiencies. Insofar as tensions on the yarn are concerned the flyer and the way the winding spools are made exercise the greatest influence. The flyer only acts as a guide for the yarn as it is being drawn off the spools yet it constitutes one of the big problems in the rayon crepe throwing industry. It seems peculiar that a small piece of wire in the form of the flyer can have so much bearing upon the production and quality of the yarn. The mechanics of the flyer can be improved immensely and with some collective thought by engineers and throwsters and a flyer probably could be developed which would be a vast improvement over the ones now in use.

There are only three machine companies who have devoted much thought to the improvement of flyers in the last few years. The engineer who makes a fool proof flyer for rayon crepe throwing will receive the respect of the entire industry. The best that can be hoped is a flyer which will exert a uniform strain on the yarn from end to end and throughout the running of individual ends.

There is much room for general improvement in the mechanics of the spinning operation but any effort should be directed toward developing more precision, and making yarn at lower cost. Any cooperative effort of throwsters and mechanical engineers in improving this process should bring generous rewards.

TWIST SETTING OR STEAMING

After high twist has been inserted in rayon yarn it is lively and it tries to kink and untwist. To overcome this tendency and to cause the torsional forces producing these desires to lie dormant for the subsequent processes, the yarn is placed in steam boxes and is saturated with water vapor. The methods of setting the twist or steaming rayon crepe yarn have been vastly improved in the past few years by the introduction of electrical heated vapor boxes. As in drying, this operation has received the benefit of the advancements made in other industries, therefore, it has progressed more than the specialized throwing machinery.

REDRAWING OPERATION

The purpose of the redrawing operation is to transfer the finished yarn from the spinning shafts or spools to a suitable shipping spool and to remove any extraneous matter which might be present on the yarn. This operation is the simplest in the throwing plants and receives the least amount of mechanical attention, yet it is very important because the finished package reflects the care taken in processing the yarn in all of the operations.

In principle most of the redrawing machines are similar to the winders except that instead of the yarn being drawn from a skein it is drawn from the spinning shaft or spool.

A recent survey showed that the redrawing machines are not very standard but that each plant has altered the machines to fit its individual needs. The spool sizes vary with each plant so that each plant adjusts the redrawing machines to fit its spools. Since the drawing spools are driven by frictional contact with pulleys on the main shaft there is some variation in speed from spool to spool which could only be overcome by using more positive drives. The tension from end to end also varies considerably and it seems that by the use of proper tension devices this variation could be eliminated. When the tension varies excessively the pebble of the finished fabric can be effected so this factor cannot be overlooked. There is an urgent need of many mechanical improvements in this operation and it should not be difficult for progressive mechanical engineers to easily make many marked improvements with very little effort.

OPPORTUNITY FOR MORE IMPROVEMENT

Throughout the throwing plants there seems to be a good opportunity to reduce the power consumption. There is a surprising absence of modern bearings on throwing machinery when by so little endeavor many friction points could be made to consume much less power.

The use of control and recording instruments has grown in throwing plants yet there is still a big field open for the development of more instruments in nearly all the operations.

It will be observed that all through this discussion I have urged closer cooperation between the mechanical engineers and throwsters and the need for more precision in all of the throwing operations. There is a good demand not only for minor improvements but for some pioneer research on entirely new principles and I think that machine makers would be well recompensed by any effort they put into further developments in this industry. Throwsters should not hesitate to provide the machine makers with suggestions for improvements. Any cooperative effort by mechanical engineers and throwsters should result in many improvements in the production and quality of rayon crepe yarns.

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DISCUSSION

Dr. Olney: Before the general discussion begins, there are a few questions I would like to ask Mr. Macia. Mr. Macia, you spoke of new sizes in your paper. Will you explain further as to the chemical nature of these sizes?

Mr. Macia: I do not profess to be an expert on sizes but I do know that some of the new sizes are made of synthetic resins and some of them have met with considerable approval. Chemical manufacturers, however, will not reveal the detailed chemical structure of these sizes.

Dr. Olney: Is there much variation in the quality of the sizes and oils used at the present time?

Mr. Macia: I think there is probably more of a question of variation than there is actual variation in the sizes and oils used by throwsters. Most throwsters are not in a position to maintain analytical chemists, therefore, only make periodic tests of their oils and sizes through outside sources. I have never followed the detailed control analysis of shipments of oils and sizes to throwing plants, therefore, I am not going to guess at the amount of variations that might be present.

Dr. Olney: You had a good deal to say about the precision in the winding operation. Will you discuss that a little further?

Mr. Macia: An example of the need for more precision in the winding operation in throwing plants is the variation which exists in the hardness of wound spools. In most throwing plants, spools vary considerably in hardness from spool to spool and often times within individual spools. Frequently a spool may be hard inside while the outside may be quite soft. This causes bad spinning.

Dr. Olney: Dr. Briggs had something to say this morning about cooperation and at meetings of this kind much cooperation may be received from the listeners as they may have valuable supplementary statements to make. I hope the discussion of this paper will be full, and even though Mr. Macia may not be able to answer all the questions put to him, I am sure that others in the audience can. May we now have the questions.

Mr. Holterhoff: I believe you just mentioned that resins are used in soaking preparations. Are they used only in such cases where they are not to be removed?

Mr. Macia: Synthetic resins of which I spoke are water soluble and are completely removed in the boil-off process.

Dr. Manning: How far has the Throwsters Research Institute gone with the investigation of tensions. Between what limits do tensions have to vary on the winding machines and throwing machines to get visible variation in crepe? All these remarks that have been made come down to the question of how much tension and how much variation do we now get on modern types of throwing machines?

Mr. Macia: In order to answer I would have to divulge many of the results of the rayon crepe research. In this connection, however, we made a survey of several throwing plants—the best in the country. We tried to find out what the ranges of tension were and the amount of variation in tension. It is hoped that these results will soon be published. I can report that we found a lot of variation in tension but, in spite of the variations, we had to assume that good cloth was going to be made from the yarn we found running in these various plants. From the results of these surveys we processed yarn using the extremes of tension and we have woven this yarn into fabric so I think that we have covered the subject fairly well.

Dr. Manning: In a general way which would be more important, a wide variation in winding and a narrow variation in the throwing process or a narrow variation in winding and a wide variation in throwing?

Mr. Macia: In all variations there seems to be the same tendencies. Regardless of where the variations occur I would say they are about equal as far as the risk of damage is concerned.

Dr. Manning: Do slight variations on the throwing machines reflect in the finished cloth more than slight variations on the winding machines?

Mr. Macia: No.

Mr. Ramsey: As regards the effect irregularity in tension may have upon the finished cloth, I find that if irregularities are excessive then the pebble of the finished cloth will vary. If it was possible to process yarn with a positive definite tension at all times, we would never overstretch the yarn.

Dr. Ganzell: How would it be possible to eliminate dirt which every now and then comes into the twisting?

Mr. Macia: This is a problem of the individual mill and cannot be included in our research work.

Dr. Ganzell: Are you familiar with a defect generally called tramage?

Anonymous: What is tramage?

Dr. Ganzell: Tramage is an irregularity apparent upon examining a finished piece of dress crepe fabric. The filling appears warped or shrunk. It is a defect which at times repeats but is not regular over the whole piece. It is often thought that it is caused by an improper creping operation.

Anonymous: Perhaps Mr. Macia can add something to this question?

Mr. Macia: Tramage is a term which originated in fabrics made of silk. Originally the term was used to describe variations in the denier. It consists of filling bars or bands which vary from 2 inches to 6 inches in width. As applied to rayon crepe fabrics the defect is rather obscure and is often times difficult to see. If you stand still and look directly at the cloth you see the bars but because they are no sharp lines of demarcation you are not sure they are there. They can be compared with indistinct rings in a defective stocking.

Dr. Manning: Tramage may be due to insufficient drying after soaking or improper setting of the twist. In order to overcome a condition such as that from the sizing standpoint alone, it might be well to experiment with more binding or increase the amount of gelatine so contraction does not occur in the twist too rapidly.

Dr. Olney: We will now hear from Mr. James McGibbon of the North American Rayon Co. who will present a paper entitled "Effect of Embossing and Boil-Off on Finished Crepe Fabrics."

Effect of Embossing and Boil-Off on Finished Crepe Fabrics*

JAMES J. McGIBBON†

AS a rayon technician familiar with fabric variation found in ladies' dress crepe fabrics, particularly during falling markets, I am pleased indeed of the opportunity afforded me to address a gathering composed largely of engineers and to call to the attention of capable engineers the relationship existing between the visible variations found in fabrics and the machines through which these fabrics are processed in dyeing and finishing plants.

Mr. Macia, representing the A. A. T. C. C. on the one hand and the Throwsters Institute on the other, and through them in addition the rayon producer, the weaver and the dyer as well, has already told you of the relationship between yarn and fabric processing machinery and visible variation in merchandise. I will tell you of the relationship between dyeing and finishing machinery and visible variation in finished merchandise.

It has long been known that embossing reduced fabric variations due to: differences in the rayon itself, differences in the soaking and throwing operations, and differences in the weaving operations. In fact the introduction of the embossing operation reduced claims to a very pronounced extent and improved the appearance of certain classes of merchandise to a very pronounced extent.

The embossing machine consists of two rollers, a hard and a soft roller, theoretically capable of being operated at a uniform temperature and pressure. The hard roller is engraved with a pattern of raised effects. This pattern is imparted to the soft roller by the hard roller and is imparted to crepe fabric processed through the machine.

One type of pattern used is shown in the enlargement on the easel at my right. This pattern represents a No. 2 roller and is used to produce a rather fine type of low pebble. The fabric will contain many small raised and depressed spots rather than a fewer number of more pronounced raised and depressed spots. The type of pattern produced by a coarser roller is shown by the second enlargement. (See Figures 1 and 2).

Fig. 1—Pattern of a Number 2 Roller.

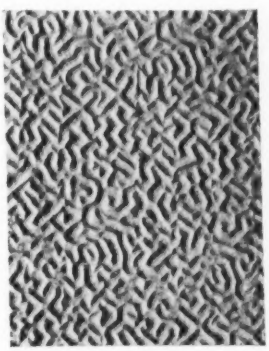

Fig. 2—Pattern of a Number 4 Roller.

The purpose of embossing patterns on crepe fabric is to predetermine the type of pebble that will subsequently be produced in the boil off bath to be discussed later.

Whereas the embossing machine has successfully eliminated many fabric variations of the type discussed by Mr. Macia, it has unfortunately produced certain inherent defects of its own. Fortunately for the dyeing and finishing industry many of the purchasers of dyed and finished crepe fabrics are today in ignorance of the existence of, the cause of, and the extent of this damage. Fortunately dyers and finishers have developed technique that

*Presented at Rayon Conference, May 14, 1937.
†North American Rayon Co.

reduced this danger and machine manufacturers have developed equipment that eliminates a large part of the danger. Also dyers and finishers have learned to refuse to emboss those types of fabrics most easily injured by the embossing operation.

The damage caused by embossing machines is twofold: —1. Broken filaments in the warp; 2. Breaks in the filling.

The warp-wise damage is most frequently encountered, yet rarely detected by those who buy and sell dyed merchandise, as these people are usually satisfied if the fabric appears uniform and possesses the proper drape and hand. Fabric manufacturers and rayon producers who should be most concerned about any merchandise that gives the ultimate consumer less than normal wear and value have overlooked, for the most part, embossing damage because specific complaints have been few. To me it appears an educational campaign along these lines should be as beneficial to the industry as a whole as was the campaign against the overweighting of knit goods when that proved to be a source of ultimate consumer dissatisfaction.

The warp-wise damage of which I speak consists of broken filaments throughout the warp, the damage sometimes being so great that a 10" length of acetate warp yarn possesses insufficient strength to hold together when removed from the fabric.

Fillingwise damage when encountered is much more readily detected as it invariably shows up as breaking of the filling threads during the tentering operation during dyeing. Both types of embossing damage are caused by insufficient control over pressure applied to the fabric. Both can be eliminated by better machine control and better manipulation. Fool-proof embossing machinery is of course the proper answer, particularly in view of the type of labor that must be employed in dyeing and finishing plants.

Another prolific cause of fabric variation is to be found in the so-called boiling off machines and processes. Crepe fabrics contain latent creping power imparted by the crepe twisting operations and held dormant until needed by the sizing materials and crepe setting operations previously discussed by Mr. Macia. When crepe fabrics are immersed into aqueous baths containing wetting out and detergent materials this latent creping power is released. The effect is somewhat similar to releasing a coiled spring with this exception—there is a greater tendency of the crepe yarn to uncoil or untwist than in the case of the metal coiled spring.

That part of the power that exerts itself in drawing the fabric together causes shrinkage. The balance of the creping power is expended as untwisting or creping power. As the yarn cannot untwist it throws itself into spiral effects as per the drawing shown on the easel.

To one unfamiliar with the phenomenon it is perhaps difficult to understand why a regenerated cellulose should apparently display this creping power while a wire, much more rigid, does not. It is my personal belief that the cause is to be found in the swelling which occurs when a rayon yarn is immersed in water. The regenerated cellulose swells longitudinally to some extent and laterally to a very pronounced extent. As the yarn is already crowded closely together by twist the swelling action of the water tends to force the yarn into kinks or loops. The released creping power accomplishes the rest.

Depending upon the denier, the type of yarn, the number of filaments, the soaking material and the throwing processes, the extent to which the creping can ultimately exert itself varies considerably from fabric to fabric. The nature of the warp yarns and the sizing treatment applied also affects the ultimate pebble. Obviously every different style of fabric from every different mill requires a different treatment, if the best results possible are to be obtained during the dyeing and finishing.

The bulk of the boiling off equipment in use today does not permit anywhere near the flexibility of treatment that should be available as a working tool in the dyers' hands. Also the competitive dyeing prices do not permit the average dyer to use to the fullest extent such tools as he has available. The average boil-off machine consists of a simple immersion roller, a propelling roller, a tank 15-20 feet long in which these rollers operate a secondary immersion tank and a rope scouring machine that is in actuality simply an old silk weighting machine put to a new use.

With the rope scouring machine little fault can be found except the fact that one unit is not sufficient to give enough cleansing to all types of fabric. Two sets of machines should be employed.

The real weakness of the average boil off machine is to be found in the initial or crepe setting unit. This apparatus does not allow sufficient time for the best results to be obtained on the average fabric and definitely produces much poorer results than should be obtained on all types of fabric on which the creping power must be released slowly.

Those who produce rayon yarns and rayon crepe fabrics in the grey would like to see more activity on the part of dyers and finishers and on the part of machine manufacturers along this line as such activity will produce better merchandise. On the other hand, all in the industry know that present prices are not conducive to expensive research.

To obtain the best results, mechanical equipment should be produced that would enable fabrics to be immersed at any desired temperature and processed very slowly in two or more baths at the same or different temperatures with the minimum amount of warp-wise tension.

It is not the purpose of this lecture to deal with the

dyeing and finishing operations and their effect on pebble as these angles have been thoroughly covered by others in the literature.

The chemists in the rayon producing and fabric producing end hope you in the engineering end will soon see your way clear to produce new andbetter machines that will give better ultimate consumer value and incidentally reduce our worries and troubles to some extent.

DISCUSSION

Dr. Olney: I have several questions I would like to ask of Mr. McGibbon.

1. *Q.*—Is it possible to produce embossed fabrics free from the defects you have discussed?

A.—Obviously yes, millions of yards are so processed every year. The defects usually occur when a new type of fabric is handled for the first time in a specific plant or when the embossing machine is set before being hot enough, and subsequently develops extra pressure that cuts the goods, or when the pressure changes anywhere within a run. I have seen cuts of fabrics perfect from 10 to 30 yards and badly cut through the balance of the piece.

2. *Q.*—In your opinion what percentage of the fabric processed contains the embossing imperfections you have discussed?

A.—For some strange reason the percentage varies greatly with the market. Available evidence indicates most fabrics are cut when the price of dyed fabrics is falling. Actually no one knows, because partially damaged merchandise passes to the ultimate consumer on a rising market and much damaged merchandise remains undetected even in a falling market, due to the fortunate fact that the buyers of fabrics are not looking for this type of defect.

3. *Q.*—Are there any boil-off machines in use along the lines you have discussed?

A.—One dyeing and finishing firm has gone to the expense and effort of building several of such machines, the results of which are that they boil off certain types of merchandise outstandingly better than the machines of other firms. Obviously, this is not the place to mention specific plants—other individual firms have produced special machines for specific merchandise that have given good satisfaction.

4. *Q.*—What effect does temperature have on the shrinkage or creping of rayon cloth?

A.—Temperature speeds up the action to a pronounced extent—some fabrics must be given an initial treatment at the boil to obtain a maximum speed, whereas others must be given an initial cool or cold treatment to prevent the creping from taking place too fast. Defects known as "cracks" develop when the fabric crepes too fast or too slowly.

5. *Q.*—Does the chemical constitution of the various baths to which the fabric is subjected affect the creping action?

A.—Sulfonated oils and other wetting-out agents increase the rapidity of creping.

6. *Q.*—Do the drying operations affect creping?

A.—In my opinion to a greater extent than is usually appreciated. Rapid drying increases creping.

Dr. Olney: This subject is now open for further discussion.

Mr. Ramsey: If the embossing process does not actually cause the breaks in the filling will it not tend to shorten the life of the material?

Mr. McGibbon: I do not know of any data available that can confirm or deny your thought.

Dr. Barnard: Regarding the embossing process, I would like to make it a little clearer. When embossing is carried on you actually crack the cloth the way you want it to go. If the embossing is properly done it does not damage the cloth. On the other hand many people claim that although embossing improves the character of the pebble it produces a pattern effect. At the present time most embossed fabrics is 2 x 2; 4 x 4 and 6 x 6 are not embossed.

Dr. Olney: Are there many pebble effects that can be produced through the use of embossing machinery that you can't get any other way?

Mr. McGibbon: Embossing is primarily used to promote uniformity.

Dr. Ganzell: I have repeatedly heard the complaint that embossed goods would not scour off as well as unembossed goods.

Mr. McGibbon: When the embossing machine is operated normally there is no special difficulty in removing size due to the effect of embossing.

Dr. Bonnet: Excess temperature of embossing increases scouring difficulties. I encountered one instance of temperature being run high enough to melt cellulose acetate warp yarns and cause them to run into the filling in spots.

Mr. Manning: When a hot embossing roller contacts fabric the moisture which has been taken up is eliminated by the heat. Therefore that portion of the yarn from which moisture is lost will not boil off as rapidly as the balance, so the embossing decreases the boil off value of the size.

Dr. Olney to Mr. Sellars: I understand that you have made something of a study of the effect of warp upon the production of pebble. Can you give us a little information concerning this?

Mr. Sellars: I am sorry but we are not making any detailed study—just experiments that I am not at liberty to discuss at the present time.

Dr. Olney: Perhaps Dr. Hunter can give us some of his views on creping.

Dr. Hunter: We have been making some experiments in order to find out what was going on. One of the interesting things we found is that probably all of the

creping that is done in the boil off is done very rapidly—within a minute or two minutes.

Dr. Olney: I understand Mr. Brundberger might give us some information about the effect of elongation of rayon itself on pebble.

Mr. Brundberger: We have made some tests with high elongation yarn along with lower elongation yarn. Some work is still being done at the plant along those lines. We have found that a low elongation yarn produces high pebble.

Mr. Wood: I would rather hear the name embossing changed to equalization, because I don't know that the embossing remains throughout the processing operation. I think it just controls and is not the finished effect. I would not say that embossing results in a reproduction of the pebble of the roller.

Have you noted any ill effects from the so-called synthetic sizes? There may be a danger from using gelatin and formaldehyde in the same fabric.

I don't quite agree with Dr. Hunter that the creping takes place as rapidly as he would lead us to believe. It takes place within 30 seconds (beginning of the creping) but completion takes much more time than that. You will find that the shrinkage in width continues for two-thirds of a normal 20 minute boil off period.

Dr. Hunter: I will mention free creping of a free piece of fabric. Commercial machines interfere with free creping.

Mr. McGibbon: Certain synthetic resin sizes have liberated formaldehyde during storage and embossing, resulting in setting the gelatin on the warp. I can see no objection to synthetic sizes that are soluble themselves and that do not in any way effect the gelatin.

Dr. Ganzel: Does anyone know whether embossing on rayon is just as effective for obtaining a good crepe effect as on acetate and rayon?

Mr. McGibbon: Acetate rayon is more plastic but there has been some embossing done on viscose rayon.

Dr. Ganzel: Have any of you men done much work on waves per inch (pebble), the relation between the two and what causes the relationship?

Mr. McGibbon: There is in existence a testing machine that, it is claimed, will measure shrinking power and creping power.

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Friday Evening, May 14

Chairman: M. X. Wilberding, Chairman, Washington, D. C. Section, A.S.M.E.

Toastmaster: Harrison E. Howe, Editor, Industrial and Engineering Chemistry.

Speaker: Howard Ketcham, Howard Ketcham, Inc., Color Engineering. "Color Comes of Age".

Mr. Ketcham's remarks, in part, follow: "Functional validity appropriately enhanced through significant color treatment, is a factor of leadership that is enabling certain firms to outstrip their less artful—less colorful—rivals.

"The validity of the specific response which color evolves makes it an active and aggressive factor in promoting the sale of fountain pens, the happiness of women, etc., ad infinitum. Yes—color comes of age, but its growth has hardly started. We shall see color engineering rising to an acceptance such as is accorded engineering in bridge building—skyscraper construction, automotive development and chemical and technical control of thousands of products and processes.

"To achieve continued success in the constantly changing mass movement in color choice, manufacturers are obliged to keep abreast of the consciousness of the color consumer.

"To accomplish this consistently and efficiently, industry has adopted color engineering. With this help, a trend is maintained toward small and more active inventories. It has long been known that competition along lines of price, quality and workmanship has proved too limited, too profitless. It has served to stifle the opportunity to excel. There is, however, no limit to the variety of style combinations which the imagination is capable of creating with color.

"We have learned comparatively recently that now smart and attractive merchandise sells easier and at a better price than that which is merely useful or cheap. In all this the correct color has become the most important single factor—affording as it does an easy low-cost escape from standardization.

"Illumination can never be completely effective with just the sun or artificial light sources. Here again color engineering can apply remedial measures that are simple but effective.

"In advertising, too, color will soon be coming into its own. Even a casual glance through almost any publication will prove convincing of the degree to which advertisers rely upon color today. As related to words, color can either emphasize the truth or insinuate a contradiction."

Motion Picture on Rayon Production and Finishing—Furnished through courtesy of The Viscose Company.

SESSION III

Saturday Morning, May 15

9:30 A.M. Lecture Room, 4th floor, East Building, U. S. Bureau of Standards.

Chairman: Herbert J. Ball, Lowell Textile Institute, representing Committee D 13, American Society for Testing Materials.

"The History of Rayon in the Retail Field" by Ephraim Freedman, Director, Macy's Bureau of Standards, R. H. Macy & Company, Inc. (Paper follows).

The History of Rayon in the Retail Field*

EPHRAIM FREEDMAN†

ALMOST five thousand years ago, in ancient China, an empress, Si-ling, is reported to have invented a loom, presumably for the weaving of silk. How many years before then was silk known to the ancients, history does not record, but these things we do know—

Royalty guarded the secrets of its art.

Emperors set up monopolies surrounding its trade and manufacture.

Nations vied with each other to cultivate it.

Millions of dollars were lost in many unsuccessful attempts to reproduce it on a vast and paying scale.

But to this day it is successfully produced on a really large scale only in the Far East and its worth, which during the reign of Aurelian (270-285 A. D.) was reported as being equal to its weight in gold, is now down to $1.82-$1.87 per lb. and has been as low as $1.13 (Sept. 1934).

Always it was sought by the rich and coveted by the poor, but usually being so costly and so difficult to obtain, the poor seldom came to own anything of silk.

The idea of making an imitation silk presented itself long before the chemical composition of the animal fiber was known. The literature teaches us that Robert Hooke had some such idea in 1664 and R. A. F. de Reaumur in 1734. The actual age of artificial silk began about 82 years ago, when a patent was granted George Audemars. There followed Chardonnet, 30 years later with another patent. During the same year the term "artificial silk" was used by Sir Joseph W. Swan to describe a fabric he had produced from filaments of regenerated cellulose. Despeisses in 1890 patented the cuprammonium process. In 1892 Cross & Bevan patented the viscose process and in 1895 they also patented the acetate product which, unlike the others is not a regenerated cellulose but rather a mixture of acetate-esters of cellulose.

Now, the domestic industry boasts of three industrial processes.

The output for 1936, was

Viscose and Cuprammonium...214,926,000 lbs.
Acetate ..... 62,700,000 lbs.

The manufacture of nitrocellulose rayon was discontinued in the United States in 1934.

Comparing this total output of 277,626,000 lbs. with the 60,126,140 lbs. of silk imported into the United States in 1936, we find that for every pound of silk, there have been produced approximately 4.6 lbs. of these relatively new products, even though the greatest handicap to be overcome was the unfortunate coining and use of the term "artificial silk".

By 1924, the term "artificial silk" had become so obnoxious, that leaders in the department-store field arranged conferences to help choose a name which, it was hoped, would forever remove the stigma that had attached itself to these newer fibers. Industry was invited to cooperate. The name coined was "Rayon", and under its new name, the art has developed to the stage where rayons may be purchased with the assurance that they will prove eminently satisfactory.

Unfortunately while the production of rayon has increased to 277,626,000 lbs., consumer information concerning it is still rather meagre and frequently erroneous. The public still knows little or nothing about it, many teachers are still to be informed, while authoritative compendiums of fairly recent vintage continue to spread not quite so authoritative descriptions of its qualities.

One of the foremost encyclopaedias, in its 1937 edition devotes but two brief paragraphs to rayon, one of which quotes the technical definition, and refers the reader to "Silk, Artificial" and to "Cellulose".

Under "Silk Fabrics, Artificial", appears the following highly erroneous and damaging statement:

> "Except in the production of knitted and lace goods, as well as a small variety of woven luxury fabric of the most delicate texture, artificial silk is of such a character that it may only be employed successfully when in combination with threads produced from the natural textile fibers, in order to constitute a foundation texture of sufficient stability according to the specific use for which the fabric is intended. It should be realized, therefore, that the special function of artificial silk (so far as the textile industry is concerned) is that of embellishing and enriching textile fabrics of any description that permit of decorative treatment".

Perhaps there was considerable truth to the above statement 15 years ago, but during the ten years that I have been intimately acquainted with rayon, I am pleased to

*Presented at Rayon Conference, May 15, 1937.

†Director, Macy's Bureau of Standards, R. H. Macy & Co., Inc.

say that on the whole, its use has spread to many undreamed of commodities, it has been improving in quality, gaining in popularity, increasing in demand, and actually satisfying the craving for style as well as for utility at a price usually within the reach of all.

One of the first specimens submitted for laboratory test was a rayon undergarment. The question asked was "Would it be likely to go to pieces?" Rayon undergarments were mighty heavy in those days. They were made of coarse filament 150 denier yarn and their dry-bursting strength was frequently recorded up to 120 pounds Mullen test. When knitted fabrics of viscose rayon disclosed a dry-bursting strength of less than 90 pounds, or a wet-bursting strength of less than 65 pounds, they were reported as being "weaker than the usual run of rayon", and their purchase was discouraged.

Now we approve undergarment material having a dry-bursting strength of 40 pounds and a wet-bursting of 40 pounds. Probably this will cause some to wonder why the requirements were reduced.

The answer is that in those days the yarns were not of uniform quality. In fact there were different grades of yarn. Garments made of the poorer grades developed holes quite frequently and examination of the fabrics placed the complaints in the lower bursting strength groups.

Today however, imperfect yarn in any of the rayons is a rarity. The manufacturing processes are being watched very carefully and quality is being maintained and even though sheerer and lighter undergarments are being sold there are hardly any complaints. Incidentally, we had less trouble with the knit acetate and silk fabrics and permitted lower bursting strengths.

Rayon milanese weaves were looked upon with disfavor because their dry-bursting strength was only 73 lbs. Knit fabrics made of one class of 30 filament, 150 denier rayon were found to be considerably weaker than the 24 filament, 150 denier fabrics of another class.

Still other 112 filament, 150 denier rayon knit fabrics disclosed a dry-bursting strength of 74 lbs. and a wet-bursting strength of 64 lbs. and were found to offer then, as now, exceptionally good value in the knit undergarment field.

Agents for all of the different rayons were anxious to get as great a distribution as possible and our buyers were frequently at a loss to decide which type of rayon to buy.

Each type of rayon had its own following, and retail buyers were besieged with claims purporting to prove that each of the four different kinds of rayon was the best obtainable.

Our buyers were hungry for the truth about these claims and so we proceeded to help them.

The first bulletin issued by Macy's Bureau of Standards in April 1928, described the count, resistance to perspiration and fading, and the bursting strength of some undergarments made of one of the four types of rayon. It also reported on the appearance and bursting strength of these garments after 25 launderings, finding less than one per cent loss in strength, but considerable shrinkage in one direction and stretch in the other direction.

Immediately we were asked how this particular type of rayon compared with the others and so, in May 1938 we instituted tests for bursting strength on fabrics made of all four types. These tests were repeated after three (3) washings.

The department store buyer interest in rayon by this time had become so marked, that a salesman, after failing to interest one buyer in his weighted silk garment, offered it to another buyer as a silk and rayon mixture. This was our first experience with silk masquerading as rayon. Recently we again had some silk and rayon fabrics offered to us as rayon.

In June 1928 after testing 100 denier yarns of the nitro, cuprate, viscose and acetate rayons, for tensile strength wet and dry, and per cent elongation wet and dry, we issued to our buyers, a bulletin entitled "Rayon Yarns". In it, we stated: "Due to the increasing use of rayons and various claims put forth by different companies our laboratory has conducted tests in order to obtain first-hand information as to strength and degree of stretch or elongation; in both wet and dry conditions." There followed the results of tests, which naturally assisted our buyers in evaluating the offerings of vendors.

Some objection was raised when we applied the term rayon to all of the synthetic cellulosic fibers but these objections gradually disappeared. In March 1929, we issued a bulletin giving a brief history of rayon. This bulletin also contained charts which depicted the tensile strength and elongation of rayons in terms of grams per denier, the sunlight hours required for deterioration, the moisture content of rayon other than acetate, and the moisture content of acetate rayon.

In 1931, we undertook a more intensive study of the strength, wear-resistance, and degree of thermal insulation of knit goods made from the four different rayons. The goods were all made of 150 denier yarn and knit on the same machine. The results of tests were made available to our buyers, but were not published because to do so would mean divulging the companies and we naturally did not want to give any one company an undue advantage over the others.

From the outset we were faced with the problem of complaints resulting from the improper handling of rayon. It soon became quite apparent that consumers would have to be educated to the proper care of these fabrics if their sale was to be continued. Many washing and dry-cleaning tests were conducted and methods for washing and ironing were made available for our customers.

The laundry-owners and dry-cleaners also had to be educated. Their experiences with the rayons were far from being satisfactory because they were not yet able to identify rayons nor were they acquainted with the proper methods of handling them.

I recall distinctly a pair of rayon and cotton pajamas. It was a very stylish model and rather expensive. The owner was traveling from place to place throughout the country and the set had been washed in numerous laundries until it reached one in Colorado from which it emerged in tatters. Obviously this laundry did not recognize that it contained rayon, or else it did not know that rayon could not be handled quite like cotton. We had to make good.

The Laundryowners National Association and the National Association of Cleaners and Dyers undertook to campaign for labeling of merchandise and at the same time told their members how to recognize, particularly the acetate rayon, and also how to launder them.

When transparent velvet came into vogue the price of $6.50 and $7.00 per yard did not prevent the sale. The fact that the merchandise was very perishable resulted in many complaints which involved not only the cost of the material but also large sums for dress-making charges. There was nothing else to do but to inform the purchaser just what to expect or not to expect from the merchandise. This we did by posting signs in the department and accompanying the merchandise with enclosures which informed the reader that "We do not guarantee the wear of transparent velvets".

Some very pretty damask bed-spreads made of rayon were purchased and submitted for test. The line consisted of some ten ortwelve different colors, all of them very attractive. They washed perfectly and disclosed exceptional resistance to sunlight. I do not recall a single complaint on any of those spreads.

Rayon curtains were in many instances found to be washable, but the greatest set-back was that they either shrank or stretched excessively.

Several years ago a set of rayon bed sheets were submitted to us for test. We rapidly came to the conclusion that rayon did not belong in this type of merchandise and up to the present time have not changed our opinion. The same applies to rayon towels. Rayon napkins and table cloths have proven quite satisfactory. Particularly when combined with some other fabric such as cotton or linen.

For years we looked with great suspicion upon umbrella cloth made of rayon because of the loss in strength when it was wet. During the past year we have been using the Crock-Meter to permit us to determine the resistance to wear of umbrella cloth especially when wet. We were surprised to find that some rayon umbrella-cloth was really very serviceable. In addition to disclosing high strength and wear-resistance, we recently found one to offer a degree of water-repellancy heretofore found only in the high-priced silk cloth.

When rayon bathing suits first came into the market we looked upon them with disfavor. Today rayon bathing suits are proving highly satisfactory to many thousands of wearers. We do not feel that rayon stockings have yet been developed to the state where they can replace silk stockings. Nor do we believe that rayon socks are as durable as silk ones. Furthermore, the deep tones still bleed excessively. Nevertheless, the use of rayon permits many people to purchase inexpensive and smart looking socks at little cost.

Some years ago rayon sewing thread was submitted for test. Upon conclusion of our work we found that the thread was not quite up to our expectations of what sewing thread should be like. Although some manufacturers have been using it, we believe it has not yet been developed to the extent where it can replace other fibers.

Much rayon is being employed for covering comforters. Because of the greater smoothness of the rayon fibers and yarns, the problem of slippage plays an important part. It is very important that feathers stay inside of the comforter and that moths stay out.

An interesting complaint called to my attention was that of a garment made of rayon and silk which was stored in a clothes closet. The rayon in the garment faded badly while the silk kept its color. The customer in this instance stated that for some unaccountable reason any rayon garments stored in this particular closet faded while silks retained their color. Subsequent tests in our laboratories disclosed that the rayon dye-stuffs were not resistant to acid fumes.

I am not in a position to say where most of the rayon is being used, but I suspect that by far the greatest quantity goes into the manufacture of women's dresses. More rayon undergarments and negligees are being sold than ever before. Rayon linings for men's, women's and children's coats and suits and for luggage and handbags are rapidly replacing other types. Men's rayon suits, particularly for summer wear, may become quite the vogue because of the recent development of crease resistance.

Drapes and curtains, raincoats and shower curtains are but a few of the thousands of articles in which rayons are used.

The American Society for Testing Materials, through its Committee D-13, has been devoting considerable study to rayon. In 1932 Dr. Harold De Witt Smith published a very interesting paper entitled, "Some Aspects of the Structure and Properties of the Rayon." In this he reviewed the type of rayon as defined in the Society's Rayon Specifications and offered a survey of the internal structure of rayon so as to aid in the drawing up and revision

of rayon specifications as well as in the successful utilization of rayon in the textile mill.

The work of Committee D-13 of the American Society for Testing Materials has been of inestimable value to retailers and consumers as well as to the rayon industry. It has encouraged studies of strength, water-absorption, shrinkage, washability, crease-resistance, wear-resistance and warmth, all of which are of considerable importance.

The work of the American Association of Textile Chemists and Colorists has also been of considerable value to retailers.

A number of technical and trade periodicals are acting as excellent purveyors of information surrounding rayons. Unfortunately, but little of this data gets to the ultimate consumer.

Last October, I conducted a series of surveys in a grammar school, a high school, a college and among some of our customers. I found that much misinformation existed. I also learned that many people realized that they knew little or nothing about rayon. What a marvelous opportunity for the rayon industry.

Consumers are really becoming more information-minded. Consumers are insisting upon having information attached to their merchandise so as to permit them to know what they are paying for, how it compares with other merchandise and how they should use it in order to obtain satisfactory service.

Even though most people know so little about rayons or how they are manufactured we find that rayons are becoming increasingly popular.

The difficulties which consumers encountered years ago are rapidly being dissipated. Women now know how to wash rayons, how to iron them and how to wear them. When rayons are accompanied by informative labels pertaining to the proper manner of caring for them, there is hardly anything left for the ultimate consumer but to enjoy the vast variety of rayon fabrics in their many and varied combinations. Rayons are now obtainable in many different fabrics both knitted and woven. The art of dyeing rayon has progressed so that almost any color or combination of colors is obtainable and at reasonable cost. Designers and stylists are creating garments and drapes of exquisite beauty.

The resistance of old has passed away. In its stead has come a widespread and increasing demand for rayon ranging from 5c ribbons to $250.00 gowns. Complaints are rare, consumers are remaining sold on the worthwhileness of this merchandise. It rests with rayon manufacturers and those to whom they sell to supply even more information about their merchandise and to help further educate the public to the end that rayons may become even more popular.

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Note: Mr. Freedman's talk was followed by the following papers, concluding the session.

"Manufacture of Cut Rayon Staple" by F. Bonnet, The Viscose Company.

"Stainless Steels and their Application in the textile and Rayon Industries" by G. W. Hinkle, Metallurgist, Republic Steel Company.

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Laboratory Methods for

Desizing Cotton Materials*

R. E. HOWELL†

AMONG the many things the chemists are called upon to do is to desize cotton, yarn, and cloth; both in the grey and finished. For this reason I wish to discuss for a few minutes the desizing methods used in the laboratories. The object of this discussion is to point out, if possible, the great need for a standardized method. A method that has been worked out and so written that it will be easy for the young chemist just beginning in this work to follow through without the variations in results we are now getting. The methods being used today are so general that chemists find it almost impossible to check each others results. This is very confusing to the mill man who sends duplicate samples to two different laboratories and gets back results that vary too widely, and possibly show a very different "natural loss" in the cotton. (This natural cotton loss is the loss of natural oils, waxes, etc., in the cotton and is removed when the sample of cotton is treated by one of these methods. The amount removed depending on the method used.) Perhaps one chemist has used one method and the

*Paper presented before the Southeastern Section.
†Chief Chemist, Frank G. North, Inc., Marietta, Ga.

other another. Both may be correct, according to the method used, or if they both used the same method, the method is so general that too much is left to the imagination of the chemists and they have given different interpretations of the meaning of the method. There are dozens of laboratories over the country making these tests. And until the methods are modified and made more specific, these laboratories will continue to report these differences in results.

I wish to discuss briefly three methods for the desizing of cotton goods. Two of these methods are well known and used by many chemists. The third is not so well known, but due to its simplicity and shortness, deserves attention.

First, I will discuss the method recognized by our own Association and published each year in the "Year Book." And I might say here, that I have just received the 1936 issue of this publication and find that the Tentative Method as given this year is just the same as given in the 1930 edition. I do not wish to criticize the committee on desizing. What I have to say is certainly from a constructive angle and I trust that it will be accepted as such. But the fact remains, that the method has not been improved in the past six years.

This method is known as the Malt Enzyme method and is as follows:

Moisture: Weigh accurately about 10-15 grams of cloth, depending upon the character and weight of material, in a large glass stoppered weighing bottle. Dry at 212-221° F. (100-105° C.) until the weight is constant. Before weighing the dried cloth, stopper the bottle containing the cloth and allow to cool in a desiccator, opening the stopper momentarily just before weighing. Calculate the loss in weight as percentage of moisture.

Oils, Fats, Waxes (Softeners): Place the sample after the moisture determination in a Soxhlet extractor with a plug of absorbent cotton on the bottom and extract with carbon tetrachloride until no more soluble matter is removed. If sufficient heat is applied to the extraction flask so that the solvent is condensed at the rate of about two drops per second, the solvent-soluble material in the sample can be completely removed in four to five hours at the most. Collect the extract in a weighed flask, distill off the bulk of the solvent, evaporate the remainder on the steam bath and dry the residue to constant weight at 212-221° F., cooling the flask in a desiccator before each weighing. Calculate the weight of the extract to a percentage basis on the original cloth.

NOTE: If carbon tetrachloride is not available either chloroform petroleum ether or benzol may be used in its place.

Soap (Softeners): Place another weighed flask under the Soxhlet extractor containing the cloth and continue the extraction, using grain alcohol or specially denatured alcohol No. 30 as a solvent. Four to five hours extraction is usually sufficient when heat is regulated so solvent condenses at the rate of two drops per second. Distill off the bulk of the alcohol, evaporate the rest on a steam bath, then dry to constant weight at 212-221° F. Calculate the percentage of alcohol-soluble material.

NOTE: In case the original sizing or finishing mixtures contains humidifiers such as magnesium chloride, calcium chloride, or glycerine, or contain zinc chloride as an antiseptic, these materials will be extracted to a certain extent in the above procedure as they are alcohol soluble. The error introduced, however, is usually of minor importance unless they are present in excessive amounts, in which case the weight of the alcohol extract may be corrected by analyzing it for these ingredients.

Total Sizing or Filling and Finishing Materials: Remove the extracted sample from the extractor, rinse it well in water and then digest for 1 hour in a dilute solution (2-3 per cent) of malt enzymes such as Diastafor, Rapidase, Diastase, or enzymes of fungus origin such as Polyzime "P" (due to its high concentration, considerable less of this enzyme is required than that of regular malt products) at a temperature not over 140° F. (60° C.). After this treatment, wash the material well, then boil in distilled water for 1 hour, rinse, squeeze as dry as possible, place in weighing bottle and dry to constant weight at 212-221° F. The weight of the material at this stage represents the amount of pure bone dry cotton fiber. Add as a correction 1.75 per cent of its weight and calculate to a percentage basis.

NOTE: The treatment with malt enzymes and subsequent boiling with water, removes in addition to starch, filling and finishing materials, a certain amount of natural extraction matter of cotton and possibly some fiber. It has been found that this extract ranges from 1 per cent to 2.75 per cent and it is customary to take as an average, 1.75 per cent as a correction to be added to the weight of the bone-dry cotton fiber. This figure for natural extractive matter is necessarily approximate. The actual solubility depends upon the treatment the cotton has received, whether the goods have been bleached or are "in the grey," etc. Where possible the actual loss should be determined on the cotton used in making the fabric in the case of sized grey goods and on the bleached and unfinished goods in the case of finished bleached fabrics. in order to get accurate results.

In case a preliminary analysis of the cloth shows it to contain added mineral substances, determine the ash of the dry cotton fiber and make the following corrections in the percentage of dry cotton fiber. In the case of grey or unbleached cotton fiber if the percentage of ash exceeds 1 per cent, correct the percentage of dry cotton fiber by deducting the excess ash over 1 per cent and for bleached cotton deduct 0.08 per cent.

Calculations: The normal regain for cotton fabrics is 6.5 per cent. To convert the percentage of bone-dry cotton to normal cotton, therefore, divide the bone-dry percentage by 0.935. The difference between this figure and the percentage of bone-dry cotton is the percentage of natural moisture. The difference between 100 per cent and the percentage of natural cotton represents excess moisture, total sizing, filling and finishing materials.

NOTE: It is generally conceded in the case of cotton fabrics, that the regain value seldom exceeds 6.5 per cent of the dry weight.

Now let us consider for a few minutes a few of the points I wish to call to your attention concerning this method. You will note that no suggestion is made as to preparation of the enzyme solution, how long the enzyme

should digest before using, etc. These enzymes are different and of different strengths. I would suggest that a suitable enzyme be made standard, one that can be easily obtained and as cheap as possible. This one correction would be a step towards standardizing the method.

Some definite range of temperatures should be adopted for the digestion bath, as from 130-140° F. The ratio of volume of solution to weight and kind of sample is another important point. If the cloth is heavily filled it will naturally require more enzyme solution to remove this material than if the cloth is in the grey, thus helping to remove the danger of leaving part of the filler in the cloth. The volume and kind of container is important. One chemist may use a 250 c.c. beaker and another use a half gallon aluminum boiler. The evaporation of the solution during digestion should also be considered.

If the sample is washed, rinsed, squeezed, etc., without the aid of a proper screen, fine lint and fiber will certainly be lost. This loss can amount to so much that the results are too high in per cent of added weight. A sieve made of No. 12 bolting silk or 100 mesh copper wire should be used. You can easily see why different chemists using different equipment, enzymes, etc., get different results.

The time required to desize a sample of cotton or raw yarn and a sample of cloth is about 23 hours.

The second method I wish to discuss is known as the Acid-Alkali method and is recognized as the official method by a number of organizations. I have here a pamphlet which is a copy of "The Standard Specifications and Tests for Cotton Goods for Rubber and Pyroxylin Coatings," prepared by the "Association of Cotton Textile Merchants of New York," "The Cotton-Textile Institute, Inc.," "Association of Pyroxylin Coated Fabrics Manufacturers," "Automobile Fabric Manufacturers Division of the Rubber Manufacturers Association, Inc." These specifications and methods of testing were accepted Jan. 1st, 1931, by 40 textile manufacturers and their selling agents. This Acid-Alkali method for desizing cotton fabrics is outlined in their specifications and is as follows:

Sizing: 1. Cut one square foot of fabric and dry to a constant weight in a ventilated drying oven maintained at a temperature of 220° to 230° F. Samples shall be weighed from time to time; when two such weighings not less than 10 minutes apart do not show a loss more than .1 per cent of the previous weight, the material is considered to be bone-dry. These weights can be obtained in a conditioning or drying oven with a weighing device mounted on top in such a way that the samples may be weighed while they are in oven; or, if no such weighing device is available, the samples may be taken from the oven and very quickly inserted in a glass stoppered bottle. The bottle, with samples, may then be weighed and the tare weight of the bottle subtracted.

2. Boil for 30 minutes in a one-half of 1 per cent hydrochloric acid solution; such solution is to be boiling before the samples are placed in it.

3. Remove samples and rinse thoroughly in clear water.

4. Boil the samples for 30 minutes in a 1 per cent solution of sodium carbonate; the solution is to be boiling before the samples are placed in it.

5. Remove samples and rinse thoroughly in clear water.

6. Obtain bone-dry weight as described in 1.

7. Calculate the percentage loss in weight between 1 and 6 and subtract 3.2 per cent as an allowance for the extracted weight of oil, waxes, and other foreign matters; the difference arrived at is considered to be the percentage of size. (In arriving at the average of 3.2 per cent as given above, many tests were made in the following manner: by cutting one yard of yarn from beam before it entered slasher and then cutting a one yard sample of the sized yarn and also a one yard sample of cloth from loom, and boiling them in same process; the actual average is 3.2 per cent. The low being 2.63 per cent and the high 3.85 per cent.)

You can see that the method is too general and should be modified. It has been my good fortune to serve on a committee working on this method and in October, 1935, the committee submitted a modification for consideration. This modified method is more specific and was taken as a starting point towards a more perfect desizing method. The method is as follows:

(a) Cut 20 grams of cloth from four sections of the sample, so as to minimize the danger of some minor irregularity from one part of the cloth to another that would affect the results. Dry to a constant weight in a ventilated drying oven maintained at a temperature of 220-230° F. Weigh samples from time to time and when two such weightings do not show a loss more than .1 per cent of the previous weight the material is considered bone-dry. If weighting is done in an oven with weighing device mounted on top of oven, weigh at intervals of ten minutes, otherwise if samples have to be removed from oven weigh at intervals of thirty minutes. In such case, the sample is quickly placed in weighing bottle and cooled in desiccator to room temperature before weighing.

(b) Boil samples for thirty minutes in 1,000 c.c. solution of 0.5 per cent hydrochloric acid (this solution is made by taking 5 c.c. of C.P. 38 per cent hydrochloric acid and making up to 1,000 c.c. volume) such solution to be boiling before samples are placed in container and maintained at, or near, boiling point during rest of period. Containers to be covered to maintain constant volume.

(c) Remove samples and rinse thoroughly in strainer made of 100 mesh copper wire in clear hydrant water. Collecting all ravelings and lint from strainer.

(d) Boil samples for thirty minutes in 1,000 c.c. of a 1 per cent solution of sodium carbonate, such solution to be boiling when samples are placed in and maintained at,

or near, boiling point during rest of period. Containers to be covered to maintain constant volume.

(e) Remove samples and rinse thoroughly as described in (c).

(f) Obtain bone-dry weight as described in (a).

(g) *Calculations*: Calculate the percentage loss in weight from the results obtained in paragraphs (a) and (f) and subtract 5.1 per cent (with plus tolerance of 20 per cent) as an allowance for the extracted weight of oils, waxes, and other foreign matters. The difference arrived at is considered to be percentage of size.

The committee is still working on this method and hope to make additional improvements soon. Some of the same criticism can be applied to this method as was given to the Malt Enzyme method. The cotton loss as recognized by these specifications is 3.2 per cent. Last year we found that the average cotton loss of many samples of cotton from South Georgia, Alabama, Texas and Oklahoma was actually 5.1 per cent by this method.

The time required to desize a sample of cotton or yarn and a sample of cloth is about 12 hours.

The third method I wish to discuss is known as the Ammonium Persulfate method.

The ammonium persulfate solution is prepared by dissolving 40 grams of the crystals in 1,000 c.c. of distilled water.

Method: Sample the cloth by cutting pieces one inch square from different sections of the cloth. If the material is yarn, cut two inch lengths from different sections of the sample. Weigh 10 grams into a dried, tared, weighing bottle and dry in ventilated drying oven at 220-230° F. to constant weight. Cool in desiccator and weigh. Calculate loss as per cent moisture.

Place the dried sample in 250 c.c. beaker, add 150 c.c. boiling distilled water and boil on steam bath for 10 minutes. Add 25 c.c. ammonium persulfate solution, cover with watch glass, and boil for 30 minutes. Pour onto a sieve covered with No. 12 bolting silk and wash thoroughly under a tap. Squeeze out all water possible, recover lint and fibers from sieve, replace in moisture bottle and dry in oven to constant weight. Calculate to per cent size.

The average cotton loss for this method is 3.2 per cent. The time required for this operation is about 11 hours.

We have just completed tests on a set of samples of raw yarn and sized warps, No. 30 yarn, made from Oklahoma cotton. The results from the three methods were compiled and put into a table so as to show the comparative figures on duplicate samples.

Our conclusions were as follows: If the carbon tetrachloride and alcohol extractions are omitted in the malt enzyme method as some chemists are doing, the malt enzyme by itself does not completely remove all the oils, waxes, and other foreign materials and as a result the figures are too high.

The cotton loss by the malt enzyme method and the ammonium persulfate method are about the same, and the per cent size figure the same. The cotton loss by the acid-alkali method is about .8 per cent higher and the per cent added weight figured about one-half per cent higher.

The three methods checked within the acceptable range of error.

Using the 1.75 per cent as cotton loss as given in the malt enzyme method the per cent added weight figured to 10.68 per cent. Whereas by actual test the added weight was 8.87 per cent. A difference of about 2 per cent.

Any of these methods are suitable for this work provided that the method chosen is made more specific, and simplified to the extent that all chemists will be able to follow the method exactly alike.

In closing I would like to stress the importance of testing the cotton or yarn, when making these desizing tests, to determine the actual cotton loss. I know it is not always possible to get a sample of cotton or yarn from which the sized yarn or cloth was made, but if it is possible, please do so. This will eliminate the guess work of how much to deduct from the loss in weight after desizing, due to the waxes, oils, etc., taken from the cotton itself.

There is need of more interest in this problem of desizing and I trust that this paper will help in creating this interest to the extent that some action will be taken towards improving and standardizing a suitable method.

ONE HUNDRED AND TWELTH COUNCIL MEETING

THE Council held its 112th meeting in the King Cotton Hotel, in Greensboro, N. C., on Saturday morning, April 17, 1937. Present were President William H. Cady presiding; Elmer C. Bertolet, Vice-President; William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; P. J. Wood, Past President; Harold M. Chase and Berkeley L. Hathorne, Councilors at Large; Walter E. Hadley, Thomas R. Smith, and Ben Verity, representing the South Central, Piedmont, and Rhode Island Sections, respectively; and Harold C. Chapin, Secretary. The Treasurer's report of April 14, and the Secretary's balance sheet attached hereto, were accepted.

The proposed amendments to Articles VIII and XV of the Constitution, published in the AMERICAN DYESTUFF REPORTER of Nov. 16, 1936, and presented at the last Annual Meeting, were declared adopted by letter ballot in accordance with the Constitution. It was voted that hereafter, for a member reinstated after May 1 of any year, five dollars be considered as covering not only current dues to Nov. 1, but also previous arrears in dues.

The Chairman of the Research Committee presented a budget for research in the year beginning July 1. This was approved, conditional upon contributions to be re-

quested of the Textile Foundation and the Chemical Foundation.

The vote of the last previous meeting was confirmed, setting the time and place of the 113th Council meeting as Friday morning, June 11, at the Chemists' Club in New York. Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

Active

R. C. Anderson	R. C. Geering	F. L. Remus
John Balloch	Karl Ginter	F. C. Rice
H. B. Bergfeld	B. H. Horsfall	Carl Schlatter
G. L. Boehm	H. G. Hunziker	L. W. Sherrill
K. J. Broden	W. H. Hutchison	P. W. Sherrill
A. A. Bschorr	A. J. Kellner	J. E. Smith
R. E. Buck, Jr.	C. L. Lawsberg	Paul Speziale
D. Butterworth	G. A. MacGillivray	George Steiner
L. C. Canham	J. G. MacIntyre	T. F. Tangney
R. W. Chase	M. B. Mahaffee, Jr.	W. B. Thompson
D. B. Coates	H.R. Mauersberger	B. K. Tremaine
David Cook	H. B. McClure	W. F. Van Riper
F. C. Davis	J. L. McNeelis	Kenneth Veith
Louis Day	G. C. Miller	J. F. Verreault
Henry DeGroot	F. C. Munday	G. Von Metnitz
H. E. Engel	J. M. Myers	R. L. Ward
G. H. Ennis	J. G. Nemeth	Leon Wheeler
F. L. Feagle, Jr.	P. M. Philbin	I. H. Godlove
W. L. Fickert	A. D. J. Piesse	J. L. Green
Daniel Finkel	C. S. Powell	O. A. Grulke
J. L. Foulke	S. I. Reichart	W. F. Harper
S. Freisinger		

Junior

S. Aumuller	W. H. Espelin	Joseph Klein
J. W. Billingsley	G. W. Fiss 3rd	A. V. Morrell
S. W. Brown	J. S. Gardner	W. C. Rauch
T. E. Carr	F. B. Gill	C. A. Spratt
H. F. Clapham	G. M. Haddad	E. I. Stearns
Geo. Dobson	T. G. Hirsch	F. L. Ward
K. L. Dorman	J. A. Johnston	

Associate

J. C. Bashaw	H. Hungerford	F. S. Perkerson
H. A. Blum	Richard Kithil	Michael Shepard
F. A. Bowen	H. A. Metz	H. Shusteroff
H. H. Hatch	K. T. Nessler	P. A. Warner

Student

F. T. Simon	T. S. Waller	J. A. Woodruff

Respectfully submitted,

H. C. CHAPIN, *Secretary.*

Secretary's Balance Sheet—April 14, 1937

	Applications	*Dues regular and reinstate.*	*Dues Corp. and Sustain.*	*Miscellaneous*	*Bank charges*	*Totals*
Received by Secretary, Nov. 1, 1936, to Feb. 1, 1937	$707.50	$6,866.95	$2,105.00	$867.00	—$2.24	$10,544.21
Received by Secretary Feb. 1 to April 14, 1937	482.50	818.50	10.00	452.29*	— 1.68	1,761.61
Total received	1,190.00	7,685.45	2,115.00	1,319.29	— 3.92	12.305.82
Transmitted to Treasurer	1,102.50	7,594.20	2,115.00	924.90		11,736.60
Leaving to order of Secretary	87.50	91.25		394.39	— 3.92	569.22

*Miscellaneous items:

From R. I. Section, Annual Meeting, in addition to registration fees	$364.76
Year Books	50.15
Analytical Methods	12.85
Dyed Standards	12.00
Knitted tubing	4.78
Crock-Meter cloth	6.50
Dyestuff Reporters	.75
Carbonizing reports	.50
Total	$452.29

CALENDAR OF COMING EVENTS

Outing, Rhode Island Section, June 18, 1937, Warwick Country Club

* * *

Outing, Mid-West Section, June 19, 1937, Rochelle, Ill.

Summer Outing, Piedmont Section, Ocean Forest Hotel, Myrtle Beach, S. C., June 25 and 26, 1937.

* * *

Annual Meeting and Convention, December 3 and 4, Bellevue-Stratford Hotel, Philadelphia, Pa.

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INFORMATIVE LABELING

SOME consumer organizations have been in existence for many years. Additional ones are cropping up all over the land. Some are of local character, while others are national in scope. . . . While the aims and aspirations of these consumer groups differ in many ways, all of them have at least one common purpose: to obtain the best possible value at the lowest possible price. This purpose has existed from time immemorial and will continue until the end of time. The significant fact, however, is that consumers are rapidly becoming organized and are becoming more discerning of quality, more cautious of claims, and more insistent in their demands for factual information.

Some forward-looking retailers and manufacturers are arising to the occasion and are labeling merchandise as rapidly as possible. I use the phrase "rapidly as possible" advisedly, since in many instances the test methods have not been developed far enough to permit of simulating conditions created under normal use.

Another stumbling block to informative labeling is the lack of proper consumer terminology. . . . What shall we do about it? How shall it be corrected? . . . Maybe you can help. I know consumers will appreciate a solution to this problem. I will certainly appreciate it very much.

Probably still another stumbling block to informative labeling is the problem of controlling the uniformity of raw materials, plant operations and uniformity of products. Many factors intervene to militate against uniformity . . . but the fact still remains that he who can best control the uniformity of his product is in the best position to take business where others must reject it.

The American Association of Textile Chemists and Colorists has ever led in the development of tests and test methods of value not only to finishers and dyers, but also to consumers. The washability test, the shrinkage test, the light-fastness test, and even the test for resistance to water are but a few of the many tests it has evolved. The one really important test not yet evolved is that for measuring the loss sustained by the textile industry for failure to utilize sufficiently and to best advantage the knowledge and experience of its chemists, colorists and other technical experts. I believe that the textile industry does not really appreciate all the time and effort devoted by these men to the solution of the many constantly occurring technical problems. I believe that the textile industry has not yet begun to realize the immense contribution it could make to its investors, its employees and to the stability of conditions in general, if it were to initiate informative labeling at the source of manufacture.

. . . I believe that the feeling of confidence, which must exist between consumer and retailer, and retailer and manufacturer, cannot be developed unless there is a much closer tieup between the technical man and the sales and advertising agencies of the textile industry.

Textile chemists, colorists and other technicians have engaged in backstage work for many years. They must be brought frontstage, given more responsibility and greater encouragement. Such a move will supply the needed mortar with which to cement the confidence between consumer and manufacturer. Management must supply the mortar. Forward-looking management will, and technical men will continue to solve consumer problems.

* * *

The preceding paragraphs are quoted from portions of an article entitled "Consumer Problems" which appeared in our issue of May 31st. We believe the thoughts contained therein are of sufficient importance to be reprinted and if you have not already read the article we suggest that you do so now. The question of informative labeling in regard to consumer satisfaction is a real problem and deserves the attention of chemists, dyers, finishers, manufacturers, and retailers alike. Quality fabrics should be made readily available to the consumer and they should be so marked that the consumer will have no difficulty in ascertaining that the quality is right as far as his personal needs and desires are concerned. He should know in advance just what he is getting and just what he can expect of it. If he wants something of inferior quality, with inferior fastness properties and an inferior finish that should also be made available to him but he should know in advance just what he can expect and what he may not expect through a label that gives him this information. After all, we are all striving to satisfy the ultimate consumer, whether we work in a mill, sell to jobbers or sell to consumers directly, and if we satisfy the consumer by letting him know just what he is buying we can go a whole lot further toward reducing claims all around. If a particular fabric may be fast to certain agencies and not fast to others the consumer should be so informed before he makes a purchase. He will then know just what he is getting and what he can expect.

TECHNICAL NOTES FROM FOREIGN SOURCES

(Continued from page 326)

explanation would probably be found if the adhesion tension were also determined. Evidence that detergents are adsorbed to different extents on fibers suggests that such adhesion tension differences might be significant. Emulsification, which in general takes place in a detergent bath, is considered as a secondary factor, the conditions required for the displacement of the oils also favoring emulsification. Other things being equal, it is probable that fine emulsion or one whose drops can be easily distorted is desirable.

Internal Solubility in Soap Micelles

A. S. C. Lawrence, D.Sc.—Many organic substances are more soluble in soap solutions than in water alone. This phenomenon is due to two entirely different causes, although both may be operative simultaneously. Substances soluble in water peptize soap solutions and have their own solubility increased mutually until a saturation value is reached. This is of the order of 6-20 molecules of peptizer per molecule of soap in addition to their normal solubility in water. The attachment in this case is by dipole interaction. The complex is broken down on crystallization.

The second type is that of non-polar substances which dissolve in the interior of the soap micelle: that is, in the hydrocarbon tails of the soap molecules. This type of complex is not broken down on crystallization nor does it affect the chemical behavior of the unchanged exterior polar groups. Saturation depends on the spaces available in the interior of the loosely packed micelles. When the oil is present, their density is increased considerable. Complex molecules of high molecular weight, such as oleyl alcohol, are intermediate in that the internal solution mechanism is the main factor in taking up the alcohol but the dipole interaction follows. The influence of these factors on detergence was briefly mentioned.

Some Aspects of the Action of the Newer Detergents

E. T. Williams, M.Sc., C. B. Brown, M.Sc., and H. B. Oakley, M.Sc.—This paper comprised a brief account of the factors involved in detergent action, and desscriptions of the composition and properties of certain of the newer detergents.

Ease of removal of dirt depends upon the nature of the detergent, the nature of the surface to be cleaned, the nature of the dirt or soil, the nature of the water employed, the nature of the agitation, and, in addition, in any detergent operation regard must be paid to the possible effects of the detergent solution upon the surface being cleaned, and also the person of the user. It has not been found possible to correlate accurately the efficiency of a detergent solution with any single property of that solution, such as capacity for reducing the surface tension against air or against oil, etc. For the evaluation of detergent efficiency an actual detergent test with soiled material seems to be essential. In actual practice with cloth, it is usually possible to remove the bulk of the dirt by agitation of the cloth in the detergent solution; some spots of tenaciously held dirt may require rubbing, while stained material, such as tea and coffee stains, etc., may require a bleaching agent for their complete removal.

The types of the newer detergents taken for consideration were the Igepons, Gardinols and polyglycerol esters. The capacities of solutions of these detergents for reducing the surface tension against air or against oil, and also their washing properties on soiled cotton and woolen materials were described. In addition, figures were given illustrating the comparatively small amount of fatty matter deposited by these detergents on cloth in hard water, and finally the results of some tests on the washing action of these newer detergents in solutions of different pH values and also at different temperatures were outlined.

Some Detergent Problems of the Woolen and Worsted Industries

H. Phillips, D.Sc., F.I.C.—Wool combines with alkali, swells and absorbs detergents and other compounds. Such changes affect its physical properties and therefore its manufacturing properties, and help to decide the "handle" of finished garments.

For these reasons, in the raw wool washing process, for example, the manufacturer is possibly even more concerned about the carding, combing and spinning properties of the washed wool, than with its cleanliness. Usually a washed wool giving a water extract of pH 9.5 is favored: it is never processed when free from alkali grease or soap.

The experimental work of King suggests that wool will absorb soap more rapidly from dilute solutions, in which the soap is crystalloidal, than from more concentrated solutions in which the soap exists as colloidal aggregates. The rate of absorption of soap by wool from dilute solutions also suggests that the soap is absorbed into the interior of the wool fibers from a film which is maintained at a constant concentration. Soap absorption by wool from dilute solutions thus appears to follow similar lines to that of the absorption of crystalloidal dyestuffs studied by Speakman and Smith.

The adhesion of mineral oil for wool may be increased by the soap film on its surface and possibly the oil may penetrate below the surface of the fibers. The removal of this oil may call for the use of strongly alkaline solutions to swell the fibers and facilitate penetration.

The Solvent Action of Detergent Solutions

G. S. Hartley, M.Sc.—The paper dealt with the ability of solutions of detergents of the paraffin chain salt type to take up considerable qualities of organic liquids and even solids on soluble in water alone. The mechanism of this solution was discussed in terms of the properties of the aggregates of paraffin chain ions and the distinction be-

tween solutions and emulsions was explained. It was pointed out that emulsions, though they may be very permanent, are not, in the thermodynamic sense, really stable, whereas the solution is in a state of true equilibrium. The solutions represent a very much finer degree of dispersion than emulsions and intermediate degrees of dispersion cannot be realized. This solvent action is of technical interest in that use is made of it to incorporate in a convenient manner with soaps certain substances such as cyclohexanol which have been claimed to be advantageous in detergent processes. The possibility also of the solvent action playing a part directly in detergent processes was considered, but shown on quantitative grounds to be improbable in normal operations.

The Penetration of Fabrics by Detergent Solutions

J. Powney, Ph.D.—The mechanism of the penetration of fabrics by detergent solutions was discussed with particular reference to the conditions met with in detergent processes.

It was shown that owing to the abnormal surface-volume ratios existing within fabrics, adsorption of surface-active material may lead to considerable starvation of the penetrating solution. The possibility that long chain molecules of a detergent solution may obtain access so the inter-micellar spaces of wool fibers was also discussed.

A brief review was given of some of the methods available for the determination of relative wetting powers of detergent solutions. A new electrical method for investigating the penetration of fabrics by detergent solutions was described. Preliminary results obtained by this method show the dependence of rate of penetration upon detergent concentration, and indicate that the addition of electrolytes to detergent solutions may considerably affect their wetting-out properties.

Influence of the Structure of Sodium-Cellulose Upon the Character of Viscose Solutions

H. Goerg—Monats. f. Textil-Ind. 51, 125 (1936).—A short report of a lecture delivered before the Deutsche Forschungs-Institut fuer Textil-industrie, in Dresden, March, 1936. The paper is later to be printed in full.

The points briefly noted in the above abstracts are as follows: corresponding to the fact that sodium-cellulose once formed, on being mixed with caustic liquor of lower concentrations, does not pass over into the alkali-free form, so also the characteristics of the viscose formation itself are altered correspondingly. If a sodium-cellulose prepared in 18 per cent NaOH liquor be treated with more dilute caustic solution, a good, clear viscose can be prepared from it down to a dilution-liquor of 12 per cent NaOH. At lower figures, say 12 to 3 per cent NaOH, viscose are still capable of formation from the product, but show an increasing tendency toward fibrous structure. This is not the case when untreated cellulose is first treated in caustic of from 0 to 9 per cent, over which range alteration of the cellulose does not take place, and between 9 to 16 per cent, in which case only partial transformation takes place. With sodium-cellulose prepared with 28 per cent NaOH solution, similar facts were determined; fibrescent viscose began to be evident at about a concentration of 16 per cent NaOH.

These viscoses showed distinctly different properties, in reference to viscosity and ammonium chloride number. These values afford interesting information as to the degree to which disaggregation of the cellulose fiers has taken place.

TRADE NOTES — NEW PRODUCTS

• LEIPZIG FAIR

The Leipzig Trade Fair will be held from August 29th to September 2nd, inclusive. The Fall Fair marks the 1978th session of the historic exchange, which has been held without interruption for over 700 years. More than 5,000 of the newest products of Germany and the leading producing countries will be exhibited, including those of the United States. It is assured that some 200,000 business men from seventy-four countries will attend, rendering it the largest as it is the oldest industrial exchange in the world. The general business recovery is indicated by the increased sales of the last Fair which totalled $200,000,000—of which $64,000,000—was for export to all parts of the world.

• STAINLESS STEEL BOOKLET

"True Colors, Quick Color Changes—with Textile Equipment of Enduro Stainless Steel" is the title of a new 12-page booklet just released by Republic Steel Corporation, Cleveland, Ohio. The booklet is the result of several years' research on the part of the technical staff of Republic, in collaboration with textile dyers and bleachers in a number of plants.

The new publication sets forth in the textile man's language, the properties and fabrication of stainless steel, describing in detail the types of Euduro Stainless Steel best suited for this type of application. An interesting feature of the booklet is a series of four-color illustrations showing yarn samples dyed in beakers of porcelain, a non-ferrous alloy, and Enduro Stainless Steel. Copies of the booklet, form Adv. 179, are available upon request.

• OUTING, S.O.M.A.

The Spring Outing of the Sulphonated Oil Manufacturers Association, held at Buckwood Inn, Shawnee-on-Delaware, Pa., on June 2nd and 3rd, was voted to be one of the most successful ever held by the organization. More than 40 members of the Association and their friends attended, most of them arriving by noon of Wednesday for a preliminary round on the beautiful Shawnee Country Club golf course, followed by dinner and a well-rounded program of vocal and instrumental entertainment that evening.

On Thursday morning the championship round of golf was played on which prizes were awarded at a party luncheon that afternoon. Winners in the golf tournament were as follows: Members' low net which carried with it the beautiful S.O.M.A. silver cup was won by Arthur E. Jones, Jr. with a score 96-30-66.

Guest low net went to Arthur E. Shaw with 85-15-70. Second low net for members was won by L. L. Grombacher with 91-23-68 with second low net for guests being shared by Geo. L. Olson and Roland McDonald, each having a net of 72. Bob Brewer, a former cup winner, captured low gross with 82, closely followed by L. D. Davis for the guests with 83, second low gross for members being shared by Lloyd Koons and C. N. Morrison, each with 87. Kickers handicap for members was won by John Bader and for the guests by W. J. McCarthy, each with a 74. Other prizes were awarded as follows: Members' 3rd low net — Harold Dohner; guest 3rd low net I. M. Colbeth and Dan Healy; 4th low net for members, E. S. Atkinson; 5th low net R. S. Dane; 6th low net J. C. Cadmus and John Noble. Other prizes were awarded to A. B. McCarthy, T. J. Oertel, Fred L. Babcock, Tony McNichol, L. E. Schroeder, K. M. Dillabaugh, S. G. Slavin, B. A. Schiller, Fred Scholler, A. J. Royce, H. B. Sweatt, John McChesney, Geo. Herold, A. A. Underwood, Wm. Barshaw, C. V. Davis.

At the final luncheon a vote of appreciation was extended to the Committee responsible for the success of the outing, this committee consisting of Fred C. Scholler, Chairman, and Elmer E. Yake.

• TEXTILE TESTING COURSE

University Extension, Columbia University, of the City of New York announces the appointment of Mr. James L. Giblin, Textile Engineer in charge of New York laboratory of the United States Testing Company, Inc., as a teacher in a new evening course dealing with the "Identification, Analysis and Testing of Textiles". The course will be given on Wednesday evenings from 7:30 to 9:20 P.M. It is designed to supplement the manufacturing courses on cotton, wool, silk and rayon. It is not an advanced course in testing procedures and should be of interest and benefit to sales persons, retailers, buyers, wholesalers, mail order house personnel, home economics teachers and the textile trade in general. This course will cover all fibers, yarns, fabrics and finished merchandise. It is also of interest to students who have taken any of the other evening textile courses given at Columbia.

• JUNE TEXTILE RESEARCH

Notable features of the June issue of *Textile Research* are the preliminary program of the research on textile drying that is being conducted by U. S. Institute for Textile Research at the National Bureau of Standards, and the concluding chapters of Prof. E. R. Schwarz's "inside story" in simple terms of the problems of fiber structure. So numerous have been the requests for this popularized treatise on "Textile Fibers in the Light of Modern Science" that it will be made available by the Textile Foundation in reprint form. Copies may be had by addressing E. T. Pickard, Secretary, Commerce Bldg., Washington, D. C., or Secretary, U. S. Institute for Textile Research, 65 Franklin St., Boston, Mass.

In the same issue is notice of the appointment by the Administration Committee for the textile drying study (G. E. Hopkins, Dr. F. Bonnet and Dr. A. C. Walker) of James G. Wiegerink as research associate. Mr. Wiegerink was graduated, *Magna Cum Laude*, from Hope College, Mich., in 1933, and since then has been engaged in physical and chemical research at Ohio State University. He was selected by the committee as exceptionally well fitted for this work.

A regular feature of this magazine is its abstract service covering in brief form references of published reports on new textile research results and important technical developments throughout the world. In the June issue are over 100 such abstracts. For the benefit of members the Institute makes available either complete copies of articles abstracted or their sources.

• WORLD CHEMICAL INDUSTRY

Chemistry continued the basis of industrial and agricultural progress which was noted in almost every country in 1936 including many of the major and some of the minor chemical-consuming markets as well as the important chemical-producing countries, according to a world survey of the chemical industry made available today by the Commerce Department's Chemical Division.

While a feeling of optimism prevailed almost everywhere, hesitancy was noted in some of the chemical-producing countries, particularly with regard to plant expansion and capacity utilization lest the demand be temporary and the result of rearmament programs. As a consequence local industries of some countries were not always prepared to meet expanding demands and imports were resorted to despite the fact that domestic plants were not operating at capacity, the survey reveals.

The devaluation of currencies in the gold-block countries had little effect for the most part on chemical business during 1936 since most contracts had been made far in advance of current needs. Ample supplies, therefore, were readily available at old price levels and prompt Government intervention prevented a too rapid rise in chemical prices in those countries, it was stated.

The financial position of most large concerns improved and dividend payments were either continued or resumed.

No particularly new problems confronted world chemical industries in 1936. The year was characterized more as one of accomplishment during which efforts were made to consolidate old gains and solve problems presented in the two preceding years, according to the study.

All governments displayed particular interest in their domestic chemical industries during the year, many giving aid as well as encouragement in different ways —by establishing control which limited expansions, restricted imports, and tightened regulations regarding sales and advertising, particularly in medicinal and toiletry fields, the survey shows.

Chemical research continued on an extensive scale, considerable success was achieved and many new products were introduced to world markets by a number of countries. Chemical processes were developed both with the view to improve or protect health and to attain self-sufficiency in certain lines.

These developments were spread throughout all branches of the chemical industry and in all areas, ranging from a new perfume material obtained from "stink weed" in Australia to a meat "Sofna" in Japan. The survey reveals that Japan probably surpassed all other countries in the number of new products introduced in 1936, the number of chemicals made for the first time in the country, and new plant construction and expansion.

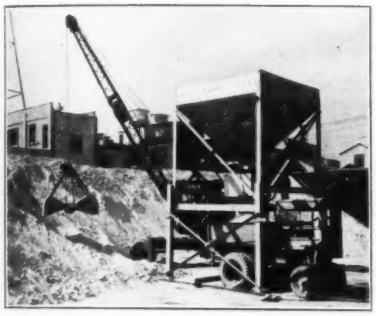
In foreign chemical markets, so far as the United States was concerned, competition in 1936 from Japanese and Russian products was not as important as in 1934, except in a few isolated instances, but Germany did succeed in obtaining a larger share of the business in certain areas. To cite specific cases, in the Far East, especially in British Malaya, a feature of the acid and industrial chemical market was reported to be Japanese competition, with prices 40 per cent under those quoted by other foreign suppliers; while sizeable shipments of calcium arsenate were received in Peru from Japan. Germany successfully penetrated Central and South American markets, and in Guatemala and Honduras, in particular, its position was much stronger, with appreciable sales of fertilizers and other agricultural chemicals being recorded.

The survey, "WORLD CHEMICAL DEVELOPMENTS IN 1936", known as Trade Promotion Series No. 169, can be obtained from the Superintendent of Public Documents, Government Printing Office, Washington, D. C., or from any of the Department's District Offices located in the principal commercial centers of the country at 30 cents a copy.

Dyestuffs intermediate being loaded from flaking machine into shipping containers. (Dye Works, Deepwater Point N. J.)

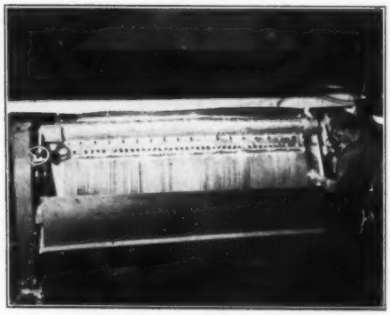
Color paste ready to go into the air dryers (Dye Works, Deepwater Point, N. J.)

Loaded dryer rack being run into air dryer. (Dye Works, Deepwater Point, N. J.)



Raw sulfur being loaded into trucks for delivery to the burners at the Graselli Plant in Philadelphia, Pa. These piles of sulfur run as much as 1,000 tons.

Still condenser used with fractionating still for separating solvents. (Plant at Deepwater Point, N. J.)

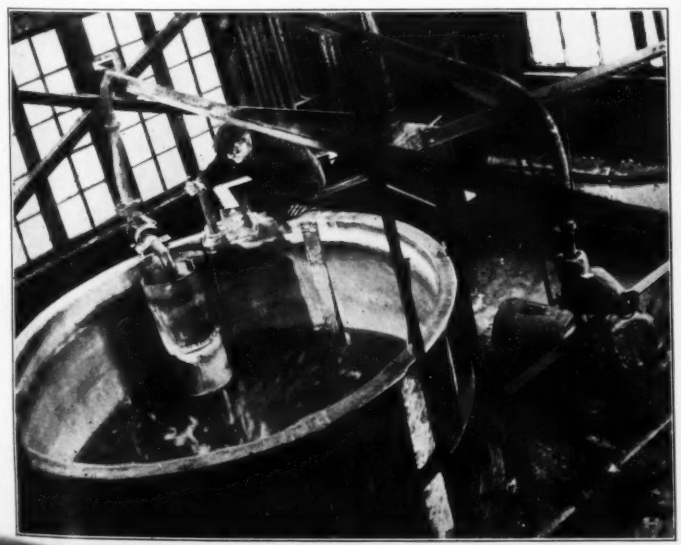


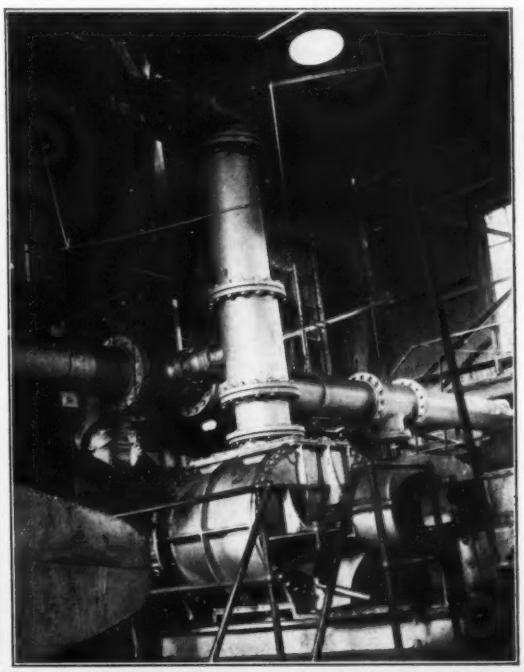
Atmospheric drum dryer. (Deepwater Point, N. J., Plant).

PRODUCTION OF CHEMICALS

Photos, Courtesy E. I. du Pont de Nemours & Co., Inc.

RIGHT—Blower which pulls the gas from the sulfur burners and blows it into the converters at the contact sulfuric acid plant. (Graselli Plant, Philadelphia, Pa.)
BELOW—Contact sulfuric acid operation known as "taking the gravity". The worker is making a test. (Graselli Plant, Philadelphia, Pa.)





● 38TH ANNUAL REUNION

The 38th Annual Reunion of the Lowell Textile Institute Alumni Association was held on Saturday, June 5, 1937 in Lowell, Massachusetts. During the morning the instructing staff was present to demonstrate and explain new equipment. A meeting of the recently formed Alumni Athletic Association was also held during the morning. A lunch was held in Assembly Hall followed by addresses by Harold W. Leitch, president of the Alumni Association, and by Charles H. Eames, president of the Institute. At 2:30 P. M. the dedication of the Campus Fence Section by the Class of 1937 took place. This was followed by a baseball game between the varsity and the alumni. The festivities concluded with a dinner at the Vesper Country Club in the evening.

● GENERAL RELEASES

General Dyestuff Corp., 435 Hudson Street, New York City, announces release of the following circulars, copies of which are available upon request:

Benzo Fast Copper Yellow G G L—a supplement to the General range of Benzo Fast Copper dyestuffs. It is a clear, greenish type said to possess excellent fastness to light and good fastness to washing. Circular I. G. 1306.

Benzo Viscose Blue B B—a new dyestuff which produces a very clear greenish blue on rayon and which is said to dye very level, to possess a very good yield and to discharge to a pure white. Circular I. G. 1312.

● ZINSSER RELEASE

Zinsser & Co., Inc., Hastings-on-Hudson, N. Y., announces the release of the following new product:

Celutate Brilliant Blue B—a new acetate fiber dyestuff producing brilliant and lively shades of blue. It is said to possess excellent dispersion properties, to be level dyeing and to possess the ability to build up to heavy shades. In addition, it is claimed to possess very good fastness to light, washing, sea water, acid, hot pressing, rubbing, etc. It may be applied to all types of acetate material, including combination fiber crepe. It may also be used as a base for brilliant shades of green.

"Celutate" is a registered trade mark of Zinsser & Co.

● AMERICAN I. G. REPORT

Net earnings of American I. G. Chemical Corporation for the fiscal year ended March 31, 1937, including a profit of $1,166,093.18 from sale of securities, amounted to $4,684,768.78, or $5.89 per common A share, as compared with $3,302,939 and $4.17 for the previous fiscal year.

Interest requirements were earned 4.32 times.

Out of earnings $750,000 were added to the debenture retirement fund and $400,000 reserved for contingencies. Total surplus aggregated $25,201,786.55.

Dividends totalling $4.50 on the common A shares and 45 cents on the common B shares were paid during the last fiscal years. The letter to the stockholders mentions the fact that the debentures are convertible at the rate of 11 shares per debenture during 1937 and of 10 shares during 1938.

● S. C. I. ELECTION

The American Section of the Society of Chemical Industry announces the election of the following officers for the year 1937-38:

Chairman.....James G. Vail
Vice-Chairman.....Wallace P. Cobor
Honorary Secretary.....Cyril S. Kimball
Honorary Treasurer.....J. W. H. Randall

The following new committee members were elected to take the place of retiring members: W. W. Winship, P. K. Frolich, F. D. Snell, F. A. Lidbury, G. M. Norman.

● PRESENTATION TO SNELL

At a meeting of the American Section of the Society of Chemical Industry on April 9, Dr. Foster Dee Snell, retiring Honorary Secretary, was presented with an engraved watch in recognition of his twelve years of active service. Dr. Robert J. Moore, past chairman, made the presentation and expressed the appreciation of the American Section for Dr. Snell's faithful carrying out of his secretarial duties.

OPEN FORUM

Rules under which this department of the REPORTER is conducted are as follows:

1. Anyone who has a technical problem on which he would like advice may submit it to the Reporter and it will be published in the first available issue.

2. Any reader who feels that he has a solution of the problem may forward his reply to us and if we feel that the reply is suitable it will be published in a succeeding issue.

3. For each such reply published the Reporter will pay a minimum of $2.

4. In case there is more than one answer to the same question, the one covering the subject in the most complete and authentic manner will be published, or if two answers are sufficiently different both will be published. If two answers are considered equally good, the one first received will be given priority.

5. The Reporter will assume no responsibility whatsoever for the accuracy of the answers submitted—it is simply offering a vehicle for the public expression of its readers' opinions.

6. Both the questioner and answerer must send in his complete name and address. When requested we will publish only the initials or other identifying insignia.

Unanswered Question

41—We would like to know the general principles of the process used in rendering silk transparent. Inasmuch as the process is to be used on rather heavy goods, we believe that one of the newer methods whereby thin layers of fiber have been rendered absolutely transparent is necessary. Information along this line which any of your readers are inclined to give will be highly appreciated.—**Library.**

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e.. help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED: Chemist capable to take charge or supervise the preparation, dyeing and finishing of rayon, acetates, cross-dyes,—Special experience in crepes—Cotton experience and original research work. Write Box No. 945, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: "Carpet Yarn Dyer" or assistant. Sixteen years' experience on axminster carpet yarns. Married. Dependable. Will go anywhere. Write Box No. 957, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.